PATTERNS OF BIODIVERSITY IN NEOTROPICAL DRY FORESTS AND SAVANNAS: CASE STUDIES FROM BRAZIL, PERU AND BELIZE

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Biogeographic Patterns, ß-Diversity and Dominance in the Cerrado Biome of Brazil

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Abstract: From a total woody flora of ca. 1000 species, a suite of 121 species forms an oligarchy dominating the cerrado biome. This mirrors patterns of dominance described in western Amazonian rain forests. Widespread sampling shows that across the biome this suite of species contributes on average 66% of the total species composition, and 75% of the total Importance Value Index in cerrado communities. An analysis of the floristic similarity between six cerrado phytogeographic provinces (southern, central and south-eastern, central-western, far-western, north-eastern, disjunct Amazonian) reveals great heterogeneity within the biome, principally of the less common species. Of the 951 species recorded from 375 floristic surveys across the biome, 494 species (more than half of the total) are found in only one of the provinces, with very few species (37 i.e. 3.9%) found in all six provinces. Each of the provinces contains a significant number of species which are apparently confined to it, ranging from 15 species (1.6% of the total woody cerrado flora) in the far-western province (primarily in the state of Rondônia) to 162 species (17%) in the central-western province. At the local level, floristic similarity can be very high. An analysis of the floristic composition of 13 sites within the Federal District shows a woody flora of 236 species, indicating that 25% of the total woody flora of the cerrado biome is represented in 0.3% of its area, illustrating the great conservation importance of this region. Floristic similarity between sites within the Federal District is high, although much of this similarity is accounted for by 'oligarch' species which account for between 59% and 89% of total species recorded per site. Informed conservation judgements within the cerrado need to take account regional floristic patterns to ensure

maximum protection of biodiversity as the majority of species are not geographically widespread within the biome.

Abbreviations: IVI = Importance Value Index (Relative frequency + Relative dominance + Relative density)

Introduction

Over 230,000 species of higher plants have been recorded in the world (Thorne, 1992), of which over 180,000 are from tropical regions (Raven 1988). There has been much research attempting to describe and explain this extraordinary tropical diversity, and to discover the mechanisms which maintain it (e.g. Pitman et al. 2001; Duivenvoorden et al. 2002; Balvanera et al. 2002; Condit et al. 2002). Of fundamental importance to understanding diversity maintenance is the concept of ß-diversity. The general definition of ß-diversity followed in this paper is that used by other authors such as Pitman et al. (2001) and Balvanera et al. (2002), first defined by Whittaker (1972) as the extent of differentiation of communities along habitat gradients. A thorough understanding of ß-diversity is vital for the selection of conservation areas. If the species composition of a geographically widespread biome does not change with distance, for example, then the location of reserves is not important. If, however, there are considerable floristic differences, careful study of the composition of local sites is essential to ensure that selection of reserves adequately protects all species.

To date, the majority of researchers studying tropical diversity have focused on tropical rain forests since they represent by far the most species-rich ecosystems (Valencia et al. 1994). Unfortunately, the floristic data available for the richest neotropical biome, the Amazon rain forest (Hylaea) are poor. Relatively few surveys have been conducted within its confines and thus data are only available for a small fraction of its enormous area. This hinders the formulation of models which might explain how, and why, diversity varies over space, and many authors have stressed the need for improved floristic datasets (e.g. Pitman et al. 1999, and Ruokolainen et al. 1997).

Tropical savanna systems can also be extremely species rich (see, for example, Mistray 2000) and as such provide alternative ecosystems on which to test models of high diversity

maintenance. The cerrado biome of Central Brazil is one such example. Mendonça et al. (1998) show that the biome contains at least 6,670 species of higher plants, whilst Dias (1992) believes the number to be greater than 10,000. Estimates of the total species richness of trees and large shrubs occurring in the tree savanna component of this biome range between ca. 1000 and 2000 species (Ratter et al. 2003; Castro and Martins 1999). Over the last 30 years there has been an explosion of research into the biodiversity of the cerrado biome. This has been fuelled by the increasing realisation that the cerrado is a global biodiversity 'hot spot' (Myers et al. 2000) and that this biodiversity is under great threat, with little over 35% of its original extent now remaining (Cavalcanti 1999).

The Brazilian cerrado originally covered some 2 million km² of Brazil (Figure 1), representing about 23% of the land surface of the country. The core cerrado region extends from the margin of the Amazonian forest in the north and west, the Caatinga in the northeast, and Atlantic forest in the east to outlying areas in the southern states of São Paulo and Paraná. The cerrado itself varies in form, ranging from dense grassland, usually with a sparse covering of shrubs and trees, to an almost closed woodland with a canopy height of 12-15m. A brief summary of the Brazilian cerrado vegetation and threats to its biodiversity is given in Ratter et al. (1997). Eiten (1972) provides a masterly review of the knowledge of the biome 30 years ago, Ribeiro and Walter (1998) furnish a detailed account of its physiognomy, and Oliveira-Filho and Ratter (2002) give an overall account of the woody vegetation.

The cerrado flora is composed largely of the same plant families and many of the genera of the Amazon and Atlantic rain forests, but at the species level its flora is very distinct. Unlike the Amazonian rain forest, there is reliable floristic information for woody tree and shrub species across the biome, making it a more suitable habitat to model diversity patterns. A recent phytogeographic study by the authors, for example, compared the floristic composition of 376 floristic surveys located throughout the cerrado region, covering 28° of latitude and nearly 24° of longitude (Ratter et al. 2003). These data permit far more accurate assessment of distribution patterns than is currently available for the Amazon rainforest. In addition, there is a far less biased concentration of surveys in areas close to research centres, with the added advantage that the majority of the taxa recorded are identified to species level, rather

than the level of family, genus or morpho-species, which is the case in many Amazonian rainforest inventories.

A number of studies have attempted to discover floristic patterns within the cerrado vegetation by comparisons using multivariate techniques of floristic surveys covering the whole cerrado region (e.g. Ratter and Dargie 1992; Castro 1994; Castro and Martins 1999; Ratter et al. 1996, 2003). The results of these studies have been much in accord, with those of the present authors suggesting a strong geographic pattern in the distribution of the flora and the presence of six distinct phytogeographic provinces (Ratter et al. 2003) (Figure 1).

Although it is clear that there are distinct floristic provinces within the cerrado, no comparative studies have been conducted on their respective floras, and the detailed 'large scale' patterns of plant diversity remain obscure. Conservation of biodiversity will necessitate choices among areas and for the cerrado there is an urgent need for clear data on floristic distributions. A recent multi-disciplinary workshop on cerrado conservation held in Brasília in 1998 (Cavalcanti 1999) attempted to prioritise conservation initiatives within the biome. This workshop clearly showed the necessity for reliable data on species distributions if future conservation planning is to be effective.

The new analyses presented in this paper are based on the same floristic data set as Ratter et al. (2003). Although these authors proposed the existence of six distinct phytogeographic provinces within the cerrado biome, no detailed floristic information has yet been published on how these provinces differ, nor a comparison made between them. This study seeks to quantify the floristic differences between the phytogeographic provinces proposed for the cerrado by Ratter et al. (2003), elucidate patterns of ß-diversity and dominance, and establish whether these patterns are similar to those proposed for neotropical rain forests.

Methods

The basis for the phytogeographic comparisons in this study were the six putative cerrado floristic provinces proposed by Ratter et al. (2003) (Figure 1). These were chosen as there is

strong evidence that they represent real floristic regional patterns, and provide a convenient tool for initiating broad-scale ß-diversity comparisons.

The floristic surveys allocated to each province using the multivariate techniques adopted by Ratter et al. 2003 were combined to provide composite species lists. These were used to provide comparative frequency data for the 100 most frequent species occurring in each province. Composite species lists for the six regions were also compared using Sørensen's Coefficient of Community to elucidate the floristic links between these provinces. Details of the surveys used can be found in Ratter et al. (2003). In addition, a smaller scale study of ß-diversity was made using Sørensen's Coefficient of Community for 13 sites in a core area of cerrado within the Federal District. Locality details are given in Table 1. These surveys are largely scattered around the city of Brasília, with 60km between the most distant sites. They are all on predominantly dystrophic soils, except for one of the two studies in the Brasília National Park which was situated on mesotrophic soil (Ramos 1995).

A list of the woody species dominating the cerrado was compiled using available species frequency data for 376 surveys (Ratter et al. 2003) based on presence/absence data and abundance data for 170 rapid surveys using the DAFOR scale (Ratter et al. 2001). The contribution of these species to both floristic composition of communities and their structural component was assessed using phytosociological data from surveys stretching across the biome.

Results and discussion

Regional β-diversity

The total woody species number recorded in the present study is 951, of which 50 (5%) are only found in the disjunct Amazonian province, 57 (6%) only in the north-eastern province, 94 (10%) only in the south-eastern province, 116 (12%) only in the southern province, 162 (17%) only in the central-western province, and 15 (1.5%) only in the far-western province (Figure 2). In total, 494 species (52%) are found only in a single province, with very few species (37, i.e. 4%) occurring in all six provinces. However, if the disjunct Amazonian sites are excluded

and only the 318 core cerrado and southern outlying sites are considered, 76 species (8% of the total) are found in all the other five floristic provinces.

These data support the findings of Ratter et al. (1996) and Ratter et al. (2003) that the cerrado is extremely heterogeneous. However, a comparison of the floristic composition of the provinces (with the exception of the disjunct Amazonian savannas) on the basis of the 25 most frequent species in each demonstrates that they all share the same small suite of frequently occurring species (see Appendix 1). Although the ranking of the species varies between regions, for the greater part they belong to the list of commonest species given by Ratter and Dargie (1992) and Ratter et al. (1996, 2003); they can be regarded as the characteristic species whose presence defines the biome.

Pitman et al. (1999) observed that a vast area of Amazonian rain forest in Peru and Ecuador is dominated by an oligarchy of ca. 150 widespread tree species which are habitat generalists. The situation in the cerrado appears to be similar. We believe from an analysis of known floristic distributions, frequency data from 376 cerrado surveys (Ratter et al. 2003), abundance data from 170 rapid surveys (Ratter et al. 2001), and our own extensive field experience, that 121 widespread 'oligarch' species dominate the arboreal vegetation of the cerrado (Appendix 2). Although other workers might question the exclusion of a few species from this list, particularly from the southern province where we have less experience, we consider this group provides the foundation of the great majority of cerrado populations – both in floristic and structural (importance value) comparisons. The core of the list (107 species) comprises those species occurring at 20% or more of the 315 core cerrado areas analysed by Ratter et al. (2003). The remainder is derived from species that from our field experience we know form a significant component of the vegetation in certain regions, even though they are not as geographically widespread as the others e.g. *Anadenanthera colubrina* – a species characteristic of more fertile soils, and *Hirtella ciliata* – a species characteristic of the north-east region, and usually abundant where it occurs. An analysis of the data from 26 published phytosociological surveys taken from across the cerrado region clearly shows that these 121 species contribute a high proportion of the total species (66% on average) and the Importance Value Index (75% on average) of communities throughout most of the biome, illustrating that this suite of species does indeed dominate the cerrado flora (Table 3).

Exceptions to this occur in São Paulo where the floristic composition of the cerrados are rather distinct as shown by the phytogeographic analyses of Castro and Martins (1999) and Ratter et al. (1996, 2003).

There are a number of variations from this pattern of widespread dominants. For example, *Acosmium subelegans* is frequent in the southern cerrados (found at 82% of sites in this region), rare in the southern parts of the central-western province, and absent elsewhere. This species is well known to have a southern distribution within the biome. Another interesting feature is the great frequency of *Caryocar cuneatum* (55% of sites) and *Parkia platycephala* (43% of sites) in the north-eastern cerrados and their absence from all other provinces. Ecological differences between the regions emerge from the lists of species defining each region. An example of this is the strong tendency of the far-western and central-western sites to be dominated by species characteristic of mesotrophic (more fertile) soils e.g. *Magonia pubescens*, *Luehea paniculata*, *Astronium fraxinifolium* and *Callisthene fasciculata* and the very low occurrence of such species in the dystrophic cerrados of the south. The tendency of certain species in the cerrado to be associated with mesotrophic soils has been well documented (see for instance Ratter et al. 1973, 1977; Furley and Ratter, 1988).

It is at the level of the less frequently occurring species that we might expect there to be more significant differences between the regions. This indeed appears to be the case. Although over 40% of the cerrado woody flora is endemic to the biome (Cavalcanti, 1999), a significant proportion (varying between 1.6 and 17.5%) is further localized and apparently restricted to one of the six floristic provinces. Floristic similarity between the provinces as measured by the Sørensen coefficient shows weak similarities between the disjunct Amazonian savannas and core cerrado areas (between 0.256 and 0.363). Amongst the core areas, the far-western cerrados show the greatest dissimilarity from all other areas (between 0.340 and 0.458). The remainder of the provinces show a similarity varying around the figure of 0.5, with between 156 (the north-eastern and southern cerrados) and 290 (the central-western and south-eastern cerrados) species in common. Each province shares between ca. 25% (minimum) and ca. 80% (maximum) of its species with each of the other provinces (Figure 2).

One of the difficulties with diversity databases is that different regions may have been sampled with different intensities, with some areas sampled sufficiently to record most of the species present, whilst other areas may have been sampled poorly, and only a fraction of their component species recorded (Fagan and Kareiva 1997). Geographical biases in cerrado floristic surveys have been highlighted by Castro et al. (1999), although many of these biases (e.g. lack of data from the states of Tocantins and Mato Grosso do Sul) have been reduced or eliminated recently through the rapid surveys conducted by Ratter et al. (2001). Although biases still exist within the floristic cerrado dataset used in this study (e.g. only 66 surveys were available for the north-eastern region, as compared to 144 for the central-western region), we believe that the great majority of woody species are accounted for in our data set, and that our preliminary ß-diversity analyses approximate real patterns.

Local β-diversity patterns

The Federal District (DF), at the heart of the cerrado biome, presents an ideal opportunity to analyse local patterns of ß-diversity as it comprises one of the best studied areas of cerrado in Brazil (Proença et al. 2001), with numerous detailed floristic surveys existing within its confines. It covers an area of 5,748 km², with predominantly flat topography and altitude varying between 730 and 1340m (Eiten 2001). Based on the collation of field surveys and an examination of the collections from three herbaria within the district, the woody flora (excluding sub-shrubs) of all vegetation formations found within the Federal District has been estimated at 1,268 species (Proença et al. 2001).

Although the floristic studies vary in area and method, a comparison of them gives valuable information on local ß-diversity patterns. The α-diversity of woody species varies widely, ranging from 52 (for the small Parque Ecológico Norte) to 140 species (for the Brasília National Park). In total, 236 species were recorded: this equates to ca. 25% of the total woody cerrado flora (as listed by Ratter et al. 2003) – in itself remarkable as it implies that one quarter of the total woody cerrado species is represented in 0.3% of the area of the biome. Of the 236 species in the 13 surveys compared, 65 (ca. 27% of the total) are only found at a single site. Only 14 species (ca. 6%) occur at all sites, whilst 94 species (ca. 39% of the total) occur at 50% or more. Of these 94 frequent species, 74 (79%) belong to the list

of 121 species we recognize as dominating the cerrado flora. Each site shares with the others a number of species varying from 32 to 89, with an average of 57 shared species. However, caution should be taken when analyzing these results as the sample areas of the studies differ markedly. Nevertheless the floristic similarity between sites is high, ranging from a Sørensen coefficient of 0.449 (between the University of Brasília Campus and the Reserva Ecológica do IBGE) to 0.883 (between the APA Gama Cabeça do Veado and the dystrophic survey recorded for the Brasília National Park). The vast majority of indices, however, are well over 0.5, with more than half being over 0.6 (Table 2).

These figures show that only a few species (ca. 6% of the 236 species recorded) can be considered ubiquitous in the Federal District cerrado, whilst ca. 70% show a relatively high frequency, and the remainder are relatively infrequent. The cerrado suite of 121 'oligarch' species (Appendix 2) comprises between 59% and 86% of the total floristic composition of each of the sites, once again illustrating the dominance of a little more than 10% of the total woody species recorded (Ratter et al. 2003). This is a pattern true of many tropical and temperate vegetation types around the world.

The analyses presented in this paper show broad scale ß-diversity patterns which should assist conservation planning as although a suite of ca. 121 woody species occur widely throughout the biome, the majority of the other species in the biome have restricted distributions. To conserve all the plant diversity present in the cerrado, conservation areas should be established across the biome and a regional focus (at the scale of the floristic province) is an important concept in ensuring that biodiversity is adequately protected. The data presented also indicate that dominance patterns within the cerrado are similar to those suggested for Amazonian rainforests. Further refinement of our knowledge of diversity patterns will not be possible until more floristic datasets become available, and there is a great need for many more geographically targeted surveys to be carried out. However, the cerrado is already one of the better understood tropical floristic 'hot-spots' of the world, and as such provides an excellent focus to investigate diversity patterns and diversity maintenance.

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CAPTIONS

Table 1. Locality details for the areas of cerrado within the Federal District compared in this study. NS = number of species.

Table 2. Sørensen Coefficient of Community between 13 sites within the Federal District. Locality details are given in Table 1.

Table 3. Contribution of the 121 dominant woody cerrado species to overall species composition and community structure for a geographically broad range of cerrado communities based on data from phytosociological surveys. SP = São Paulo; MG = Minas Gerais; MS = Mato Grosso do Sul; MT = Mato Grosso; BA = Bahia; PA = Pará; AP = Amapá; RR = Roraima. NS = No. of species in survey; DS = number of dominants (from list of 121) present; % = % of total species composition made up from dominants; %IVI = % of total community IVI contributed by dominants. NS is frequently lower than that given for the same localities in Table 1, since here phytosociological surveys were used rather than the complete species list.

Figure 1. Map of Brazil showing the locations of the sites used in the survey, and the boundaries of the six cerrado floristic provinces (after Ratter et al., 2003). Inset maps show the distribution of the cerrado within Brazil, and the geographic location of Brazil within South America.

Figure 2. Floristic links between the six cerrado phytogeographic provinces. Figures in ovals = number of woody species recorded in the province; bracketed figures in ovals = number of species restricted to province; figures in brackets = species in common between provinces; decimals = Sørensen similarity index. The oval sizes reflect the species richness of each province.

Appendix 1. Most frequent species recorded for each of the six floristic provinces. Author names can be found in Ratter et al. 2003. Figures in brackets indicate the number of sites and the % of sites at which the species occurs.

Appendix 2. The 121 dominant species of the cerrado flora. Species in bold are those typical of mesotrophic (more fertile) soils.

Table 1

Code	Locality	Co-ordinates	NS	Source
DF01	Águas Emendadas	15°31'S 47°32'W	65	Felfili & Silva Junior (1993)
DF02	Águas Emendadas	15°31'S 47°32'W	133	Silva Junior & Felfili (1996)
DF03	APA Gama. da Cab. Vead.	15°52'S 47°50'W	59	Felfili & Silva Junior (1993)
DF04	Brasilia National Park	15°37'S 47°54'W	140	Ramos (1995)
DF05	Brasília National Park	15°37'S 47°54'W	52	Felfili & Silva Junior (1993)
DF06	Fazenda Água Limpa	15°45'S 47°57'W	130	Ratter (1986)
DF07	Campus, UnB	15°43'S 47°54'W	67	Heringer (1971)
DF08	Jardim Botânico, Brasília	15°48'S 47°50'W	83	Azevedo et al. (1990)
DF09	Parque Ecológica Norte, Brasília	15°45'S 47°55'W	52	Rossi et al. (1998)
DF10	Planaltina	15°39'S 47°38'W	111	Ribeiro et al. (1985)
DF11	Res. Ecol. do IBGE	15°55'S 47°53'W	114	Pereira et al. (1993)
DF12	São Bartolomeu	15°50'S 47°30'W	137	Pereira et al. (1985)
DF13	nr. Brasília	15°55'S 47°57'W	90	Eiten & Sambuichi (1996)

Table 2.

	DF01	DF02	DF03	DF04	DF05	DF06	DF07	DF08	DF09	DF10	DF11	DF12	DF13
DF01	X	0.643	0.790	0.527	0.735	0.639	0.655	0.585	0.804	0.640	0.580	0.579	0.713
	DF02	X	0.547	0.620	0.514	0.723	0.487	0.573	0.525	0.656	0.636	0.677	0.612
		DF03	X	0.533	0.883	0.596	0.615	0.624	0.811	0.627	0.576	0.555	0.730
			DF04	X	0.500	0.721	0.475	0.604	0.490	0.624	0.629	0.610	0.605
				DF05	X	0.552	0.582	0.582	0.827	0.543	0.540	0.478	0.677
					DF06	X	0.513	0.626	0.552	0.795	0.717	0.736	0.667
						DF07	X	0.471	0.636	0.500	0.449	0.453	0.627
							DF08	X	0.582	0.688	0.539	0.561	0.580
								DF09	X	0.556	0.515	0.478	0.662
									DF10	X	0.652	0.702	0.649
										DF11	X	0.543	0.614
											DF12	X	0.619
												DF13	X

Sørensen Coefficient of Community = $\frac{2 \times \text{number of species in common}}{\text{No. species in site A + No. species in site B}}$

Table 3.

	Locality	Co-ordinates	NS	DS	%	%IVI	Source
1	Angatuba (SP)	23°28'S 48°28'W	45	16	35	31	Ratter et al., (1988a)
2	Pé de Gigante (SP)	22°19'S 49°04'W	83	45	54	54	Castro (1994)
3	Mun. de Uberlândia (MG)	18°55'S 48°55'W	40	32	80	95	Araújo et al., (1997)
4	Grande Sertão Veredas (MG)	15°21'S 46°05'W	67	54	81	84	Felfili and Silva Junior, (2001)
5	Galheiro-Perdizes (MG)	18°55'S 48°55'W	39	30	77	89	Cardoso et al. (2002)
6	Brasília National Park (DF)	15°37'S 47°54'W	42	37	88	96	Ramos (1995)
7	Jardim Botânica de Brasília (DF)	15°48'S 47°50'W	92	53	58	87	Sambuichi and Eiten (2000)
8	Fazenda Água Limpa (DF)	15°45'S 47°57'W	48	40	83	89	Ratter (1986)
9	Planaltina (DF)	15°39'S 47°38'W	55	41	75	88	Ribeiro et al. (1985)
10	Fazenda Nhumirim (MS)	18°59'S 56°39'W	29	20	69	80	Ratter et al. (1988b)
11	Baixada Cuiabana 1 (MT)	15°30'S 56°02'W	45	25	56	86	Oliveira Filho and Martins (1991)
12	Baixada Cuiabana 2 (MT)	15°30'S 56°02'W	65	48	74	87	,, ,, ,,
13	Baixada Cuiabana 3 (MT)	15°30'S 56°02'W	48	33	69	76	,, ,, ,,
14	Baixada Cuiabana 4 (MT)	15°30'S 56°02'W	70	47	67	65	,, ,, ,,
15	Baixada Cuiabana 5 (MT)	15°30'S 56°02'W	32	13	41	37	,, ,, ,,
16	Torixoreu (MT)	15°53'S 52°23'W	20	18	90	99	Furley et al. (1988)
17	Nova Xavantina (MT)	14°41'S 52°20'W	98	55	56	86	Marimon et al. (1998)
18	Ilha de Bananal (TO)	10°26'S 50°25'W	58	37	64	71	Ratter (1987)
19	Parq. Estadual do Lajeado (TO)	10°16'S 48°22'W	61	40	66	65	Santos (2000)
20	Correntina (BA)	13°23'S 44°41'W	66	48	73	84	Felfili and Silva Junior (2001)
21	Formoso do Rio Preto (BA)	11°27'S 46°00'W	68	50	74	76	Felfili and Silva Junior (2001)
22	Formoso do Rio Preto (BA)	11°27'S 46°00'W	56	44	79	74	Walter et al. (1996)
23	Alter do Chão (PA)	02°36'S 54°56'W	19	14	74	85	Miranda (1993)
24	Embrapa Research St. (AP)	00°46'N 51°18'W	11	9	82	64	Sanaiotti et al. (1997)
25	Tartarugalzinho (AP)	01°40'N 50°50'W	6	5	83	75	Sanaiotti et al. (1997)
26	Ilha do Maracá (RR)	03°22'N 61°26'W	9	2	22	73	Milliken and Ratter (1989)

Figure 1.

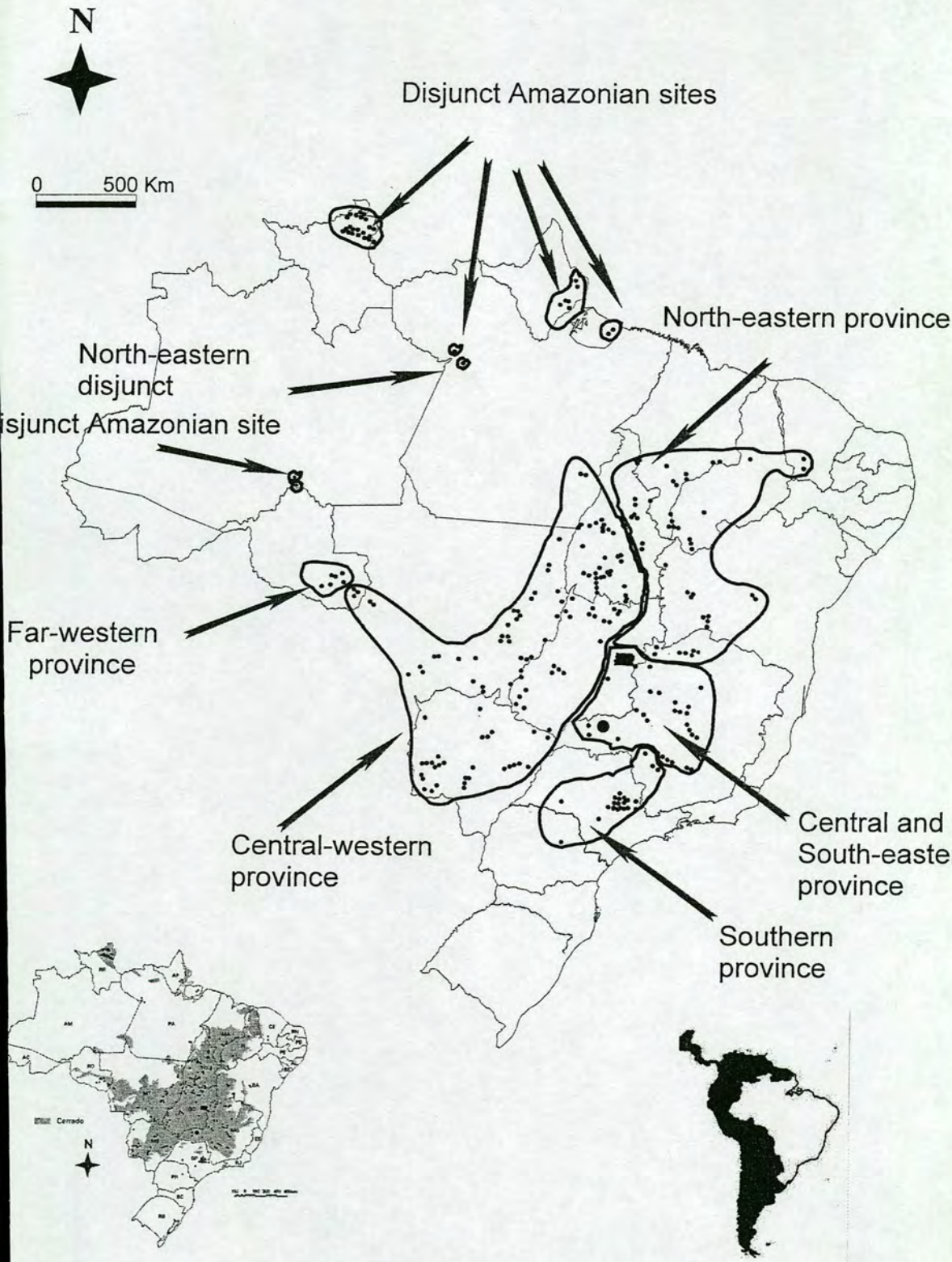
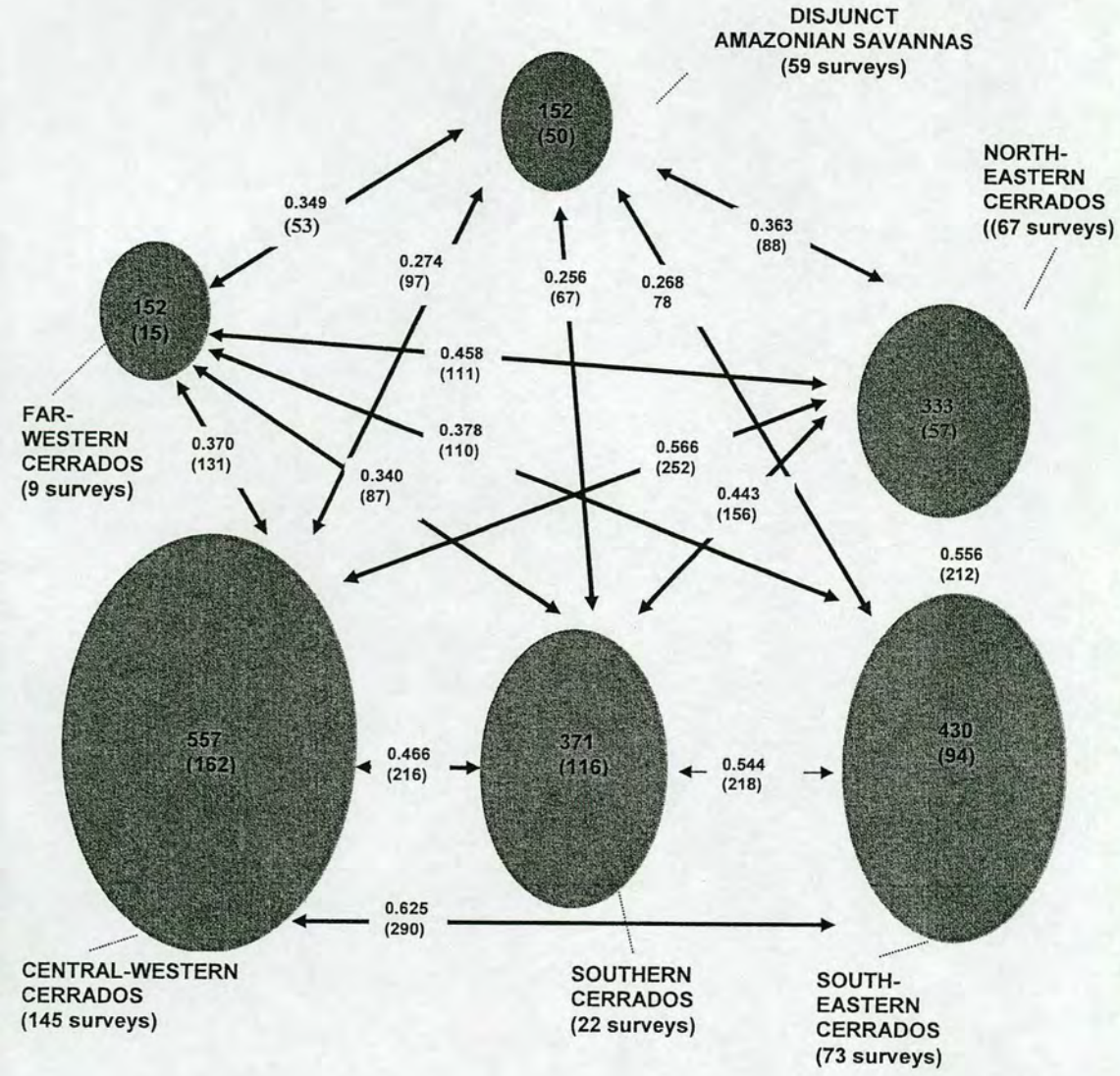

N
Disjunct Amazonian sites
0 500 Km
North-eastern province
North-eastern disjunct
isjunct Amazonian site
Far-western province
Central-western province
Central and South-eastern province
Southern province
Cerrado
N

Figure 2.


DISJUNCT
AMAZONIAN SAVANNAS
(59 surveys)
152
(50)
NORTH-
EASTERN
CERRADOS
((67 surveys)
0.349
(53)
0.274
(97)
0.256
(67)
0.268
78
0.363
(88)
152
(15)
FAR-
WESTERN
CERRADOS
(9 surveys)
0.458
(111)
0.378
(110)
0.370
(131)
0.340
(87)
0.566
(252)
0.443
(156)
333
(57)
0.556
(212)
557
(162)
0.466
(216)
371
(116)
0.544
(218)
430
(94)
0.625
(290)
CENTRAL-WESTERN
CERRADOS
(145 surveys)
SOUTHERN
CERRADOS
(22 surveys)
SOUTH-
EASTERN
CERRADOS
(73 surveys)

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ANALYSIS OF THE FLORISTIC COMPOSITION OF THE BRAZILIAN CERRADO VEGETATION III: COMPARISON OF THE WOODY VEGETATION OF 376 AREAS

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An analysis was made of the floristic composition of 376 areas of cerrado and Amazonian savanna, encompassing most of the area of such vegetation in Brazil. A total of 951 species of trees and large shrubs was recorded for these areas, of which 334 (35%) occurred at only a single locality (unicates). The core cerrado area and its outliers were studied in 315 areas, and 914 species were recorded. However, only 300 species occurred at more than eight of the sites (i.e. $\geq 2.5\%$ of the total) and only 38 species at $\geq 50\%$, while the remaining 614 species, including 309 unicates, are very rare. About 300 species, therefore, dominate the core cerrado area; this number is expanded to 350 if the southern São Paulo cerrados are included. Alpha diversity, the number of tree species occurring in a single community, is often high, with more than 100 species of trees and shrubs growing together. We noted particular 'hotspots' in the drainage of the rivers Araguaia, Tocantins and Xingu, but high diversity figures occur in many other areas of the cerrado core, and also in São Paulo state. On the other hand, the disjunct Amazonian savannas, with the exception of Alter do Chão (Pará) and one site at Humaitá (Amazonas), represent a low diversity vegetation in which 117 species of trees and large shrubs were recorded in the 58 sites analysed. Of these, 77 are widespread species common in the core cerrados. The alpha diversity of disjunct Amazonian savannas seldom exceeds a dozen species of trees and large shrubs. The data were analysed using two techniques of multivariate analysis which we had found particularly appropriate in our previous work: (a) a divisive hierarchical classification by Two-Way Indicator Species Analysis (TWINSPAN), and (b) an agglomerative hierarchical classification by UPGMA (Unweighted Pair-Groups Method using Arithmetic Averages), using the Sørensen Coefficient of Community (cc) as a measure of similarity. The results of both methods showed great similarity, demonstrating a strong geographical pattern in the distribution of the cerrado biome similar to that outlined in the preliminary scheme of our previous work. The following geographic groups were recognized:

(i) A very distinctive group of southern sites in São Paulo, Paraná and southern Minas Gerais.

(ii) Central and southeastern sites from the Federal District, neighbouring Goiás, and southern and central Minas Gerais.

(iii) North and northeastern sites from Bahia, Ceará, the extreme north of Minas Gerais, Maranhão, Piauí, Tocantins, and one site in Pará very close to the Tocantins border.

(iv) Central-western sites made up of a huge swathe running across the states of Mato Grosso do Sul, Mato Grosso, Goiás, Tocantins, and into Pará.

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(v) Widely spread sites with a strong mesotrophic character; this group is particularly well represented in Mato Grosso do Sul.
(vi) Far western mesotrophic sites, forming a small group in Rondônia, Mato Grosso do Sul and Mato Grosso.
(vii) Disjunct Amazonian sites forming a very distinct group separated from the other sites at the first division of both TWINSPAN and UPGMA.

Keywords. Amazonian savanna, biodiversity, cerrado, multivariate analyses, phytogeography, woody vegetation.

Resumo

Efetuou-se a análise da composição florística de 376 áreas de cerrado e savana amazônica, abrangendo a maior parte da área ocupada por esta vegetação no Brasil. Registrou-se um total de 951 espécies de árvores e arbustos grandes, das quais 334 (35%) ocorreram em uma única localidade (unicatas). A flora do cerrado nuclear (excluindo as savanas amazônicas disjuntas) foi estudada em 315 áreas, com 914 espécies registradas. Dentre estas, apenas 300 espécies ocorreram em oito locais ou mais (ou seja, pelo menos em 2,5% do total) e somente 38 espécies estiveram presentes em 50% das áreas ou mais. As restantes 614 espécies, incluindo 309 unicatas, são muito raras. Cerca de 300 espécies, portanto, dominam a área nuclear do cerrado e esse número chega a 350 se forem considerados os cerrados de São Paulo. A diversidade alfa (número de espécies ocorrendo em uma única comunidade) é freqüentemente alta, com mais de 100 espécies de árvores ou arbustos compartilhando o espaço. Foram observados alguns 'hotspots' na bacia dos rios Araguaia, Tocantins e Xingu, mas muitas outras áreas de alta diversidade encontram-se na região nuclear do cerrado e também no Estado de São Paulo. Por outro lado, as isoladas savanas amazônicas, com exceção de Alter do Chão (Pará) e um sítio em Humaitá (Amazonas), contêm baixa diversidade florística, tendo sido registradas apenas 177 espécies em 58 áreas estudadas. Dentre estas, 77 são espécies de distribuição ampla, comuns na região nuclear do cerrado. A diversidade alfa das savanas amazônicas raramente vai além de uma dúzia de espécies de árvores ou arbustos grandes. Os dados foram submetidos a duas técnicas de análise multivariada que se mostraram particularmente apropriadas em nossos estudos anteriores: (a) uma classificação hierárquica divisiva por 'Two-Way Indicator Species Analysis' (TWINSPAN) e (b) uma classificação hierárquica aglomerativa por 'Unweighted Pair-Groups Method using Arithmetic Averages' (UPGMA), utilizando o Coeficiente de Comunidade de Sørensen (cc) como índice de similaridade. Os dois métodos apresentaram resultados semelhantes, demonstrando um forte padrão fitogeográfico na distribuição do bioma cerrado, conforme verificado nos esquemas preliminares gerados por nossos trabalhos anteriores. Os seguintes grupos fitogeográficos foram reconhecidos:
(i) Meridional, um grupo bastante distinto composto por áreas de São Paulo, Paraná e sul de Minas Gerais.
(ii) Centro-sudeste, com áreas do Distrito Federal, áreas vizinhas de Goiás, sul e centro de Minas Gerais.
(iii) Norte-nordeste, com áreas do extremo norte de Minas Gerais, Bahia, Ceará, Maranhão, Piauí e Tocantins e uma área do Pará próxima à divisa com Tocantins.
(iv) Centro-oeste, com áreas distribuídas em uma extensa faixa através dos estados de Mato Grosso do Sul, Mato Grosso, Goiás, Tocantins e Pará.
(v) Áreas amplamente dispersas com um forte caráter mesotrófico – este grupo particularmente bem representado em Mato Grosso do Sul.

(vi) Áreas mesotróficas do extremo oeste, formando um pequeno grupo em Rondônia, Mato Grosso do Sul e Mato Grosso.
(vii) Áreas isoladas da Amazônia, formando um grupo muito distinto, separado dos outros na primeira divisão por TWINSPAN e UPGMA.

Palavras-chaves. Análises multivariadas, biodiversidade, cerrado, fitogeografia, savanas amazônicas, vegetação lenhosa.

Introduction

This is the third communication in a series reporting floristic diversity and patterns of geographic composition of woody cerrado vegetation. The first (Ratter & Dargie, 1992) reported a comparison of 26 areas of cerrado, representing all the survey records available to us in 1986–87, while the second (Ratter *et al.*, 1996) compared 98 areas for which information existed in 1994. The present communication is based on surveys of 376 areas, demonstrating the enormous increase in scientific work carried out in the cerrado biome during the last few years. When one of us (J.A.R.) started work in the cerrado in 1967 the literature on the biome was tiny, but it has now increased to a very large corpus of, often disparate, information. Much of the present interest in the cerrado has been stimulated by the realization that the biome is a world centre of biodiversity (Dias, 1992; Fonseca *et al.*, 2000; Myers *et al.*, 2000) and that it is highly endangered by the expansion of modern agriculture, already having lost nearly 50% of its original 2 million km^2 area (Alho & Martins, 1995; Ratter *et al.*, 1997).

Several recent projects have provided large quantities of information. The *Conservação e Manejo da Biodiversidade do Bioma Cerrado* (CMBBC) project based on collaboration of Embrapa Cerrados, University of Brasília, and the Royal Botanic Garden Edinburgh, with funding from the UK Department for International Development (DFID), has carried out 170 surveys in the northern and central-western parts of the cerrado biome (Ratter *et al.* 2000a, 2001). Miranda (1997) has made a comprehensive survey of the Amazonian savannas of Roraima including the inventory of 45 sites. The *Biogeografia dos Cerrados* project team based in Brasília has made many surveys in the extensive Chapadas Pratinha and dos Veadeiros in Central Brazil (see for example Felfili & Silva Junior (1993) and Felfili *et al.* (1997)), while the group of Brandão and associates has worked over a great area of southern and central Minas Gerais. In addition, Durigan (2001) and Durigan *et al.* (in press) have studied 86 areas as part of the project *Conservation Feasibility of the Cerrado Remnants in São Paulo State*, financed by the Biota Programme. Since they are so recent, data from the last project are not included in the multivariate analyses of the 376 areas in the present paper, but are considered at various points in the text. As discussed in our previous works, studies similar to ours have been carried out by Dr Alberto Jorge F. de Castro of the Federal University of Piauí (Castro, 1994a,b; Castro *et al.*, 1998, 1999; Castro & Martins, 1999) and provide essential data for comparison.

TABLE 1. (*Cont'd*)

No.	Code	Locality	Co-ordinates	NS	MS	MI	Reference
30	MG11	Fazenda Trijunção (Formoso)	14°52′S, 46°02′W	45	0	0	R. *et al.* (2001)
31	MG12	Fazenda Trijunção (Formoso)	14°52′S, 46°02′W	64	0	0	R. *et al.* (2001)
32	MG13	Fazenda Brejão, Brasilândia	17°02′S, 45°50′W	97	11	0.11	Almeida Lima (1997)
33	MG14	Felixlândia	18°45′S, 44°52′W	55	5	0.09	Brandão & Gavilanes (1992)
34	MG15	Galheiro-Perdizes	18°55′S, 48°55′W	47	0	0	Cardoso *et al.* (2002)
35	MG16	Itumirim	21°18′S, 44°48′W	47	2	0.04	Brandão & Gavilanes (1992)
36	MG17	Januária	15°20′S, 44°23′W	38	8	0.21	R. *et al.* (1977)
37	MG18	Januária	15°32′S, 44°36′W	48	7	0.15	R. *et al.* (2001)
38	MG19	Lagoa Santa	19°39′S, 43°44′W	57	6	0.1	Brandão & Gavilanes (1992)
39	MG20	Lagoa Santa	19°39′S, 43°44′W	135	11	0.08	Warming (1892)
40	MG21	Lavras	21°14′S, 44°59′W	69	5	0.07	Brandão & Gavilanes (1992)
41	MG22	Montes Claros	16°45′S, 43°52′W	74	4	0.06	Araújo (1994)
42	MG23	Montes Claros	16°45′S, 43°52′W	105	9	0.09	Brandão *et al.* (1993b)
43	MG24	Montes Claros	16°45′S, 43°52′W	76	9	0.12	Brandão & Gavilanes (1992)
44	MG25	Pandeiros	15°29′S, 44°40′W	44	1	0.02	R. *et al.* (2001)
45	MG26	Pandeiros	15°31′S, 44°45′W	50	2	0.04	R. *et al.* (2001)
46	MG27	Paracatú	17°00′S, 46°45′W	53	1	0.02	Felfili & Silva Junior (1993)
47	MG28	Paraopeba	19°20′S, 44°20′W	111	13	0.12	Thibau *et al.* (1975)
48	MG29	Paraopeba	19°20′S, 44°20′W	60	7	0.11	Silva Junior (1984)
49	MG30	Paraopeba	19°18′S, 44°25′W	60	5	0.08	Brandão & Gavilanes (1992)
50	MG31	Patos de Minas	18°34′S, 46°31′W	33	1	0.03	Brandão & Gavilanes (1992)
51	MG32	Patrocínio	18°47′S, 46°25′W	57	1	0.02	Felfili & Silva Junior (1993)
52	MG33	Pedro Leopoldo	19°38′S, 44°03′W	90	9	0.1	Brandão & Gavilanes (1997)
53	MG34	Pedro Leopoldo	19°39′S, 44°03′W	28	2	0.07	Rizzini (1975)
54	MG35	Pimenta	20°30′S, 45°50′W	73	4	0.05	Carvalho (1987)
55	MG36	Prudente de Morais	19°28′S, 44°15′W	128	8	0.06	Brandão *et al.* (1996)
56	MG37	Prudente de Morais	19°36′S, 44°04′W	58	4	0.07	Brandão & Gavilanes (1992)
57	MG38	Sagarana	16°00′S, 46°30′W	48	14	0.29	R. *et al.* (1996)
58	MG39	São Joaquim	15°29′S, 45°10′W	63	2	0.03	R. *et al.* (2001)

TABLE 1. (*Cont'd*)

No.	Code	Locality	Co-ordinates	NS	MS	MI	Reference
59	MG40	São Roque de Minas	20°22′S, 46°11′W	33	0	0	R. *et al.* (2001)
60	MG41	São Roque de Minas	20°16′S, 46°21′W	55	0	0	R. *et al.* (2001)
61	MG42	Sete Lagoas	19°27′S, 44°14′W	113	10	0.09	Brandão *et al.* (1993a)
62	MG43	Sete Lagoas	19°32′S, 44°06′W	69	4	0.06	Brandão & Gavilanes (1992)
63	MG44	Três Marias	18°12′S, 45°10′W	55	6	0.11	Brandão & Gavilanes (1992)
64	MG45	Triângulo Mineiro	19°29′S, 48°50′W	116	9	0.08	Goodland (1970)
65	MG46	Uberaba	19°47′S, 47°57′W	35	0	0	Brandão & Gavilanes (1992)
66	MG47	Mun. de Uberaba	19°47′S, 47°57′W	106	10	0.09	Brandão *et al.* (1995)
67	MG48	Mun. de Uberlândia	18°55′S, 48°55′W	68	0	0	Apolinário (1995)
68	MG49	Mun. de Uberlândia	18°55′S, 48°55′W	39	1	0.03	Araújo *et al.* (1997)
69	MG50	Mun. de Uberlândia	18°55′S, 48°55′W	46	0	0	Araújo *et al.* (1997)
70	MG51	Mun. de Uberlândia	18°55′S, 48°55′W	33	0	0	Araújo *et al.* (1997)
71	MG52	Mun. de Uberlândia	18°55′S, 48°55′W	40	0	0	Araújo *et al.* (1997)
72	MG53	Mun. de Uberlândia	18°55′S, 48°55′W	33	0	0	Araújo *et al.* (1997)
73	MG54	Mun. de Uberlândia	18°55′S, 48°55′W	41	0	0	Araújo *et al.* (1997)
74	MG55	Mun. de Uberlândia	18°55′S, 48°55′W	41	0	0	Araújo *et al.* (1997)
75	MG56	Mun. de Uberlândia	18°55′S, 48°55′W	40	0	0	Araújo *et al.* (1997)
76	MG57	Mun. de Uberlândia	18°55′S, 48°55′W	38	1	0.03	Araújo *et al.* (1997)
77	MG58	Mun. de Uberlândia	18°55′S, 48°55′W	38	0	0	Araújo *et al.* (1997)
78	MG59	Mun. de Uberlândia	18°55′S, 48°55′W	22	0	0	Araújo *et al.* (1997)
79	MG60	Mun. de Uberlândia	18°55′S, 48°55′W	36	0	0	Araújo *et al.* (1997)
80	MG61	Mun. de Uberlândia	18°55′S, 48°55′W	37	0	0	Araújo *et al.* (1997)
81	MG62	Mun. de Uberlândia	18°55′S, 48°55′W	40	0	0	Araújo *et al.* (1997)
82	MG63	Mun. de Uberlândia	18°55′S, 48°55′W	35	0	0	Araújo *et al.* (1997)
83	MG64	Mun. de Uberlândia	18°55′S, 48°55′W	40	0	0	Araújo *et al.* (1997)
84	MG65	Mun. de Uberlândia	18°55′S, 48°55′W	43	0	0	Araújo *et al.* (1997)
85	MG66	Mun. de Uberlândia	18°55′S, 48°55′W	33	0	0	Araújo *et al.* (1997)
86	MG67	Mun. de Uberlândia	18°55′S, 48°55′W	45	0	0	Araújo *et al.* (1997)
87	MG68	Mun. de Uberlândia	18°55′S, 48°55′W	27	0	0	Araújo *et al.* (1997)
88	MS01	Água Clara	20°27′S, 52°52′W	54	1	0.02	R. *et al.* (2001)
89	MS02	Água Clara	20°26′S, 53°03′W	60	0	0	R. *et al.* (2001)
90	MS03	Água Clara	20°25′S, 53°21′W	65	1	0.01	R. *et al.* (2001)
91	MS04	Anhanduí	20°49′S, 54°29′W	74	7	0.09	R. *et al.* (2001)
92	MS05	Aquidauana (Serra de Maracaju)	20°30′S, 55°37′W	43	5	0.11	R. *et al.* (2001)
93	MS06	Aquidauana	20°23′S, 56°04′W	51	20	0.39	R. *et al.* (2001)
94	MS07	Aquidauana	20°32′S, 55°24′W	68	18	0.26	R. *et al.* (2001)
95	MS08	Autopôsto de Piqui	21°16′S, 55°03′W	52	14	0.27	R. *et al.* (2001)
96	MS09	Autopôsto de Piquí (2)	21°05′S, 54°57′W	40	5	0.12	R. *et al.* (2001)
97	MS10	Bodoquena	20°23′S, 56°31′W	28	13	0.46	R. *et al.* (2001)

TABLE 1. (*Cont'd*)

No.	Code	Locality	Co-ordinates	NS	MS	MI	Reference
98	MS11	Bonito	20°50′S, 56°37′W	57	19	0.33	R. *et al.* (2001)
99	MS12	Bonito	20°58′S, 56°32′W	50	22	0.44	R. *et al.* (2001)
100	MS13	Camapuã	19°30′S, 53°58′W	64	10	0.16	R. *et al.* (2001)
101	MS14	Camapuã	19°23′S, 53°36′W	76	6	0.08	R. *et al.* (2001)
102	MS15	Campo Grande	20°26′S, 55°06′W	63	5	0.08	R. *et al.* (2001)
103	MS16	Cipolândia	20°00′S, 55°20′W	65	9	0.14	R. *et al.* (2001)
104	MS17	Coxim	18°30′S, 54°42′W	72	5	0.07	R. *et al.* (2001)
105	MS18	Fazenda Acurizal	17°45′S, 57°37′W	57	18	0.32	Prance & Schaller (1982)
106	MS19	Fazenda Água Amarela	21°46′S, 56°14′W	59	20	0.34	R. *et al.* (2001)
107	MS20	Fazenda Nhumirim	18°59′S, 56°39′W	88	17	0.19	Pott *et al.* (1986)
108	MS21	Fazenda Renascença	20°25′S, 52°46′W	70	3	0.04	R. *et al.* (2001)
109	MS22	Guia Lopes da Laguna	21°24′S, 56°01′W	59	15	0.25	R. *et al.* (2001)
110	MS23	Maracajú	21°27′S, 55°09′W	29	16	0.55	R. *et al.* (2001)
111	MS24	Paraíso	19°04′S, 52°27′W	75	3	0.04	R. *et al.* (2001)
112	MS25	Paranaíba	19°20′S, 51°20′W	68	5	0.07	R. *et al.* (2001)
113	MS26	Porto d'Areia	20°53′S, 51°40′W	56	9	0.16	R. *et al.* (2001)
114	MS27	Ribas do Rio Pardo	20°27′S, 53°46′W	72	4	0.05	R. *et al.* (2001)
115	MS28	Rio Caracol	21°41′S, 56°48′W	63	22	0.35	R. *et al.* (2001)
116	MS29	São Gabriel do Oeste	19°31′S, 54°27′W	69	1	0.01	R. *et al.* (2001)
117	MS30	Serrinha	20°37′S, 52°15′W	52	14	0.27	R. *et al.* (2001)
118	MS31	Sidrolândia	20°16′S, 55°03′W	35	12	0.34	R. *et al.* (2001)
119	MS32	Três Lagoas	20°40′S, 52°08′W	63	14	0.22	R. *et al.* (2001)
120	MS33	Inocência	20°00′S, 51°52′W	75	5	0.07	R. *et al.* (2001)
121	DF01	Águas Emendadas	15°31′S, 47°32′W	65	1	0.01	Felfili & Silva Junior (1993)
122	DF02	Águas Emendadas	15°31′S, 47°32′W	133	6	0.04	Silva Junior & Felfili (1996)
123	DF03	APA Gama da Cab. Vead.	15°52′S, 47°50′W	59	1	0.02	Felfili & Silva Junior (1993)
124	DF04	Brasília National Park	15°37′S, 47°54′W	140	13	0.09	Ramos (1995)
125	DF05	Brasília National Park	15°37′S, 47°54′W	52	0	0	Felfili & Silva Junior (1993)
126	DF06	Fazenda Água Limpa	15°45′S, 47°57′W	130	4	0.03	Ratter (1986)
127	DF07	Campus, UnB	15°43′S, 47°54′W	67	0	0	Heringer (1971)
128	DF08	Jardim Botânico, Brasília	15°48′S, 47°50′W	83	6	0.07	Azevedo *et al.* (1990)
129	DF09	Parque Ecológica Norte, Brasília	15°45′S, 47°55′W	52	0	0	Rossi *et al.* (1998)
130	DF10	Planaltina	15°39′S, 47°38′W	111	1	0.01	Ribeiro *et al.* (1985)
131	DF11	Res. Ecol. do IBGE	15°55′S, 47°53′W	114	6	0.05	Pereira *et al.* (1993)
132	DF12	São Bartolomeu	15°50′S, 47°30′W	137	6	0.04	Pereira *et al.* (1985)

TABLE 1. (*Cont'd*)

No.	Code	Locality	Co-ordinates	NS	MS	MI	Reference
133	DF13	nr. Brasília	15°55′S, 47°57′W	90	0	0	Eiten & Sambuichi (1996)
134	GO01	Porangatu	12°51′S, 49°06′W	90	13	0.14	R. *et al.* (2001)
135	GO02	Porangatu	13°50′S, 49°03′W	85	15	0.17	R. *et al.* (2001)
136	GO03	Aparecida do Rio Claro	15°52′S, 51°04′W	68	21	0.31	R. *et al.* (2001)
137	GO04	Baliza	16°30′S, 52°23′W	74	1	0.01	CMBBC (unpubl.)
138	GO05	Bandeirantes	13°41′S, 50°43′W	92	11	0.12	R. *et al.* (2001)
139	GO06	Caiapônia & Mineiros	17°22′S, 52°10′W	58	15	0.26	R. *et al.* (1996)
140	GO07	Caiapônia	16°57′S, 51°49′W	125	22	0.18	R. *et al.* (1996)
141	GO08	Campos Belos	13°16′S, 46°57′W	71	18	0.25	R. *et al.* (2001)
142	GO09	Chapada dos Veadeiros	14°07′S, 47°16′W	89	27	0.3	R. *et al.* (1996)
143	GO10	Chapada dos Veadeiros	14°07′S, 47°31′W	54	1	0.02	R. *et al.* (1996)
144	GO11	Chapada dos Veadeiros	14°07′S, 47°13′W	59	15	0.25	R. *et al.* (1996)
145	GO12	Chapada dos Veadeiros	13°55′S, 47°23′W	62	0	0	R. *et al.* (1996)
146	GO13	Chapada dos Veadeiros	14°02′S, 47°26′W	51	0	0	R. *et al.* (1996)
147	GO14	Colinas do Sul	14°26′S, 48°08′W	74	4	0.05	R. *et al.* (2001)
148	GO15	Doverlândia	16°52′S, 52°20′W	100	17	0.17	CMBBC (unpubl.)
149	GO16	Doverlândia	16°44′S, 52°37′W	72	21	0.29	CMBBC (unpubl.)
150	GO17	Jussara	16°05′S, 50°48′W	83	10	0.12	R. *et al.* (2001)
151	GO18	Iporá	16°23′S, 51°02′W	70	10	0.14	R. *et al.* (2001)
152	GO19	Israelândia	16°14′S, 50°47′W	79	16	0.2	R. *et al.* (2001)
153	GO20	Israelândia	16°19′S, 50°59′W	74	16	0.22	R. *et al.* (2001)
154	GO21	Itarumã	18°55′S, 51°27′W	75	6	0.08	R. *et al.* (2001)
155	GO22	Jataí	17°58′S, 51°45′W	61	6	0.1	R. *et al.* (1996)
156	GO23	Niquelândia	14°27′S, 48°18′W	87	11	0.13	R. *et al.* (2001)
157	GO24	Nova Crixás	14°16′S, 50°15′W	80	8	0.1	R. *et al.* (2001)
158	GO25	Crixás	14°24′S, 50° 08′W	90	14	0.15	R. *et al.* (2001)
159	GO26	Padre Bernardo	15°15′S, 48°30′W	83	15	0.18	R. *et al.* (1977)
160	GO27	Parque Nacional das Emas	17°49′S, 52°39′W	55	1	0.02	Álvares da Silva (1996)
161	GO28	São Miguel do Araguaia	13°16′S, 49°58′W	86	14	0.16	R. *et al.* (2001)
162	GO29	Serra Dourada	16°22′S, 50°20′W	40	0	0	Rizzo (1970)
163	GO30	Silvânia	16°30′S, 48°30′W	64	2	0.03	Felfili & Silva Junior (1993)
164	GO31	Sta. Terezinha de Goiás	14°22′S, 49°31′W	84	13	0.15	R. *et al.* (2001)
165	GO32	Teresina do Goiás	13°40′S, 47°14′W	88	13	0.15	R. *et al.* (2001)
166	GO33	Uruaçú	14°29′S, 49°09′W	91	12	0.13	R. *et al.* (2001)
167	GO34	Uruaçú	14°33′S, 49°09′W	90	6	0.07	R. *et al.* (2001)

TABLE 1. (*Cont'd*)

No.	Code	Locality	Co-ordinates	NS	MS	MI	Reference
168	MT01	Alto Araguaia	17°15′S, 53°21′W	54	1	0.02	R. *et al.* (2001)
169	MT02	Baixada Cuiabana	15°30′S, 56°02′W	111	21	0.19	Oliveira-Filho & Martins (1991)
170	MT03	Base Camp, Rib. Cascalheira	12°49′S, 51°46′W	129	19	0.15	R. *et al.* (1973)
171	MT04	Cáceres	16°15′S, 57°40′W	64	21	0.33	R. *et al.* (2001)
172	MT05	Campinápolis	14°16′S, 52°43′W	51	0	0	R. *et al.* (2001)
173	MT06	Campinápolis	14°15′S, 52°42′W	59	15	0.25	R. *et al.* (2001)
174	MT07	Campinápolis	14°20′S, 52°47′W	41	17	0.41	R. *et al.* (2001)
175	MT08	Campo de Murundus	12°00′S, 50°47′W	54	5	0.09	Marimon & Lima (1998, 2001)
176	MT09	Canarana	13°31′S, 52°28′W	106	11	0.1	R. *et al.* (2001)
177	MT10	Canarana	13°32′S, 52°39′W	78	1	0.01	R. *et al.* (2001)
178	MT11	Canarana	13°41′S, 52°04′W	85	4	0.05	R. *et al.* (2001)
179	MT12	Chapada dos Guimarães	15°21′S, 55°49′W	188	19	0.1	Oliveira-Filho (1984)
180	MT13	Cocalinho	12°42′S, 50°55′W	95	5	0.05	Marimon & Lima (1998, 2001)
181	MT14	Comodoro	13°50′S, 59°45′W	59	0	0	R. *et al.* (2001)
182	MT15	Comodoro	13°30′S, 59°50′W	59	0	0	R. *et al.* (2001)
183	MT16	Cuiabá	15°50′S, 56°50′W	56	3	0.05	R. *et al.* (2001)
184	MT17	Cuiabá	15°36′S, 56°06′W	37	3	0.08	Nascimento & Saddi (1992)
185	MT18	Cuiabá	15°32′S, 56°05′W	88	14	0.16	Macedo (1993)
186	MT19	Fazenda Porto do Sol	11°59′S, 50°47′W	77	4	0.05	Marimon & Lima (1998, 2001)
187	MT20	Fazenda Porto do Sol	11°54′S, 50°48′W	33	0	0	Marimon & Lima (1998, 2001)
188	MT21	Fazenda Porto do Sol	11°53′S, 50°47′W	47	4	0.08	Marimon & Lima (1998, 2001)
189	MT22	Primavera do Oeste	15°28′S, 55°00′W	64	0	0	R. *et al.* (2001)
190	MT23	General Carneiro	15°46′S, 52°31′W	60	0	0	R. *et al.* (2001)
191	MT24	General Carneiro	15°41′S, 52°41′W	70	6	0.08	R. *et al.* (2001)
192	MT25	Cocalinho (Fazenda Pequi)	14°40′S, 51°20′W	55	3	0.05	R. *et al.* (2001)
193	MT26	Cuiabá	15°32′S, 56°05′W	23	4	0.17	Guarim Neto *et al.* (1994)
194	MT27	Mario Viana, Nova Xavantina	14°41′S, 52°20′W	95	6	0.06	Marimon *et al.* (1998)
195	MT28	Nova Xavantina	14°45′S, 52°20′W	121	14	0.11	R. *et al.* (1973)
196	MT29	Nova Xavantina	14°44′S, 52°40′W	72	1	0.01	R. *et al.* (2001)
197	MT30	Nova Xavantina	14°45′S, 52°20′W	79	7	0.09	R. *et al.* (2001)
198	MT31	Poconé	16°16′S, 56°37′W	34	18	0.53	R. *et al.* (1988b)
199	MT32	Poconé	16°16′S, 56°37′W	33	16	0.48	Guarim *et al.* (2000)
200	MT33	Primavera do Oeste	15°37′S, 54°00′W	69	0	0	R. *et al.* (2001)
201	MT34	Riberão Cascalheira	13°55′S, 52°10′W	62	3	0.05	R. *et al.* (2001)

TABLE 1. (*Cont'd*)

No.	Code	Locality	Co-ordinates	NS	MS	MI	Reference
202	MT35	Riberão Cascalheira	12°49′S, 51°46′W	92	4	0.04	R. *et al.* (2001)
203	MT36	Riberão Cascalheira	13°05′S, 52°00′W	67	8	0.12	R. *et al.* (2001)
204	MT37	Rondonôpolis	16°29′S, 54°37′W	94	15	0.16	R. *et al.* (1996)
205	MT38	Serra Azul (Barra do Garças)	15°51′S, 52°12′W	62	1	0.02	R. *et al.* (2001)
206	MT39	Serra da Petrovina	16°47′S, 54°06′W	94	20	0.21	R. *et al.* (1996)
207	MT40	Tatuapé	16°59′S, 54°03′W	77	0	0	R. *et al.* (2001)
208	MT41	Torixoreu	15°53′S, 52°23′W	53	18	0.34	Furley *et al.* (1988)
209	MT42	Vale de Sonhos	15°00′S, 52°13′W	72	12	0.17	Ratter *et al.* (1977)
210	RO1	Cacoal	11°24′S, 61°38′W	32	2	0.06	R. *et al.* (2001)
211	RO2	Colorado do Oeste	12°54′S, 60°22′W	48	0	0	R. *et al.* (2001)
212	RO3	Espigão do Oeste	11°41′S, 60°37′W	55	17	0.31	R. *et al.* (2001)
213	RO4	Fazenda Cachoeira	12°31′S, 60°25′W	49	0	0	R. *et al.* (2001)
214	RO5	Alta Floresta do Oeste	12°14′S, 62°02′W	60	13	0.22	R. *et al.* (2001)
215	RO6	Pimenta Bueno	11°43′S, 61°09′W	36	8	0.22	R. *et al.* (2001)
216	RO7	Pimenta Bueno	11°44′S, 61°06′W	29	5	0.17	R. *et al.* (2001)
217	RO8	Pimenta Bueno	11°36′S, 61°13′W	27	6	0.22	R. *et al.* (2001)
218	RO9	Querência, Parecis	12°10′S, 61°20′W	42	7	0.17	R. *et al.* (2001)
219	RO10	Vilhena	12°41′S, 60°07′W	63	0	0	R. *et al.* (2001)
220	BA01	Barreiras	12°09′S, 44°37′W	43	0	0	R. *et al.* (2001)
221	BA02	Barreiras	12°09′S, 44°58′W	55	1	0.02	R. *et al.* (2001)
222	BA03	Cocos	14°01′S, 44°27′W	54	1	0.02	R. *et al.* (2001)
223	BA04	Cocos	14°05′S, 44°30′W	55	2	0.04	R. *et al.* (2001)
224	BA05	Coribe	13°52′S, 44°27′W	54	2	0.04	R. *et al.* (2001)
225	BA06	Correntina	13°23′S, 44°41′W	55	0	0	R. *et al.* (2001)
226	BA07	Correntina	13°23′S, 44°35′W	55	3	0.05	R. *et al.* (2001)
227	BA08	Fazenda Trijunção (Mun. Cocos)	14°49′S, 45°58′W	54	0	0	R. *et al.* (2001)
228	BA09	Fazenda Trijunção (Mun. Jaborandi)	14°48′S, 45°57′W	50	0	0	R. *et al.* (2001)
229	BA10	Fazenda Jatobá	13°23′S, 44°41′W	108	3	0.03	Andrade & Machado (1991–93)
230	BA11	Formoso do Rio Preto	11°27′S, 46°00′W	74	1	0.01	Walter & Ribeiro (1996)
231	BA12	Lençóis	12°29′S, 41°20′W	39	0	0	R. *et al.* (2001)
232	BA13	Lençóis	12°26′S, 41°30′W	42	1	0.02	R. *et al.* (2001)
233	BA14	Riachão das Neves	11°46′S, 44°54′W	49	5	0.1	R. *et al.* (2001)
234	BA15	Santa Maria da Vitória	13°24′S, 44°13′W	29	3	0.1	R. *et al.* (2001)
235	BA16	São Desidério	12°19′S, 44°59′W	51	1	0.02	R. *et al.* (2001)
236	TO01	Alvorada	12°31′S, 49°10′W	92	11	0.12	R. *et al.* (2001)
237	TO02	Arraias	12°47′S, 47°03′W	67	13	0.19	R. *et al.* (2001)
238	TO03	Arraias	12°39′S, 47°06′W	80	13	0.16	R. *et al.* (2001)
239	TO04	Arraias	12°53′S, 47°00′W	91	18	0.2	R. *et al.* (2001)
240	TO05	Barrolândia	09°47′S, 48°43′W	70	6	0.09	R. *et al.* (2001)

TABLE 1. *(Cont'd)*

No.	Code	Locality	Co-ordinates	NS	MS	MI	Reference
241	TO06	Bom Jesus do Tocantins	08°43′S, 47°44′W	81	10	0.12	R. *et al.* (2001)
242	TO07	Bom Jesus do Tocantins	08°50′S, 47°52′W	98	14	0.14	R. *et al.* (2001)
243	TO08	Bom Jesus do Tocantins	08°34′S, 47°45′W	56	2	0.04	R. *et al.* (2001)
244	TO09	Caseara	09°53′S, 49°53′W	60	3	0.05	R. *et al.* (2001)
245	TO10	Cristalândia	10°35′S, 49°10′W	54	0	0	R. *et al.* (2001)
246	TO11	Divinópolis	09°48′S, 49°36′W	35	0	0	R. *et al.* (2001)
247	TO12	Fazenda Belo Horizonte	10°05′S, 48°55′W	60	9	0.15	R. *et al.* (1996)
248	TO13	Fazenda Bragança	06°53′S, 47°48′W	34	2	0.06	R. *et al.* (1996)
249	TO14	Fazenda Odara do Tocantins	11°26′S, 48°53′W	79	11	0.14	R. *et al.* (2001)
250	TO15	Fazenda Odara do Tocantins (2)	11°28′S, 48°53′W	82	14	0.17	R. *et al.* (2001)
251	TO16	Figueirópolis	12°04′S, 49°10′W	76	13	0.17	R. *et al.* (1996)
252	TO17	Figueirópolis	12°14′S, 49°15′W	75	6	0.08	R. *et al.* (2001)
253	TO18	Gurupí	11°43′S, 49°07′W	83	5	0.06	R. *et al.* (2001)
254	TO19	Gurupí	11°54′S, 49°10′W	73	11	0.15	R. *et al.* (2001)
255	TO20	Gurupí	11°52′S, 49°25′W	90	12	0.13	R. *et al.* (2001)
256	TO21	Ilha do Bananal	10°26′S, 50°25′W	106	13	0.12	Ratter (1987)
257	TO22	Lagoa de Confusão	10°44′S, 49°34′W	86	18	0.21	R. *et al.* (2001)
258	TO23	Lajeado	09°45′S, 48°21′W	79	12	0.15	R. *et al.* (2001)
259	TO24	Lajeado	09°38′S, 48°23′W	63	0	0	R. *et al.* (2001)
260	TO25	Parque Estadual de Lajeado	10°16′S, 48°22′W	79	0	0	Santos (2000)
261	TO26	Monte do Carmo	10°48′S, 48°05′W	86	12	0.14	R. *et al.* (2001)
262	TO27	Monte Santo	09°53′S, 49°08′W	74	8	0.11	R. *et al.* (2001)
263	TO28	Natividade	11°49′S, 47°29′W	90	14	0.15	R. *et al.* (2001)
264	TO29	Natividade	11°40′S, 47°43′W	80	10	0.12	R. *et al.* (2001)
265	TO30	Natividade	11°53′S, 48°07′W	83	10	0.12	R. *et al.* (2001)
266	TO31	Natividade	11°41′S, 47°29′W	78	13	0.17	R. *et al.* (2001)
267	TO32	Palmas	10°01′S, 48°18′W	53	9	0.17	R. *et al.* (2001)
268	TO33	Paraíso de Tocantins	10°05′S, 48°56′W	74	7	0.09	R. *et al.* (2001)
269	TO34	Peixe	11°58′S, 48°37′W	90	12	0.13	R. *et al.* (2001)
270	TO35	Ponte Alta	10°24′S, 47°05′W	45	0	0	R. *et al.* (2001)
271	TO36	Ponte Alta	10°30′S, 47°11′W	24	0	0	R. *et al.* (2001)
272	TO37	Ponte Alta	10°27′S, 47°10′W	30	0	0	R. *et al.* (2001)
273	TO38	Ponte Alta	11°02′S, 47°28′W	81	3	0.04	R. *et al.* (2001)
274	TO39	Ponte Alta	10°39′S, 47°55′W	82	9	0.11	R. *et al.* (2001)
275	TO40	Ponte Alta	10°24′S, 47°06′W	54	1	0.02	R. *et al.* (2001)
276	TO41	Porto Nacional	10°45′S, 47°58′W	79	1	0.01	R. *et al.* (2001)
277	TO42	Porto Nacional	10°31′S, 48°22′W	77	5	0.06	R. *et al.* (2001)
278	TO43	Porto Nacional	10°26′S, 48°18′W	50	0	0	R. *et al.* (2001)
279	TO44	Pugmil	10°27′S, 48°53′W	84	18	0.21	R. *et al.* (2001)

TABLE 1. (*Cont'd*)

No.	Code	Locality	Co-ordinates	NS	MS	MI	Reference
280	TO45	Rio Sono	09°24′S, 47°49′W	73	2	0.03	R. *et al.* (2001)
281	TO46	Rio Sono	09°25′S, 47°37′W	95	11	0.12	R. *et al.* (2001)
282	TO47	Rio Sono	09°32′S, 47°40′W	73	0	0	R. *et al.* (2001)
283	TO48	Taquaras	10°19′S, 48°13′W	68	14	0.2	R. *et al.* (2001)
284	MA01	Alto Parnaíba	09°12′S, 46°03′W	65	1	0.01	R. *et al.* (2001)
285	MA02	Alto Parnaíba	09°03′S, 45°52′W	52	0	0	R. *et al.* (2001)
286	MA03	Alto Parnaíba	09°09′S, 45°55′W	56	0	0	R. *et al.* (2001)
287	MA04	Barão de Grajaú	06°32′S, 43°31′W	38	2	0.05	R. *et al.* (2001)
288	MA05	Carolina	07°07′S, 47°25′W	63	2	0.03	R. *et al.* (1996)
289	MA06	Carolina	07°07′S, 47°25′W	21	9	0.43	R. *et al.* (1996)
290	MA07	Fazenda Parnaíba	07°30′S, 46°05′W	60	11	0.18	R. *et al.* (1996)
291	MA08	Fortaleza dos Nogueiras	06°50′S, 46°10′W	79	5	0.06	R. *et al.* (2001)
292	MA09	Fortaleza dos Nogueiras	06°53′S, 46°10′W	60	1	0.02	R. *et al.* (2001)
293	MA10	Gerais de Balsas	08°38′S, 46°43′W	63	0	0	Walter *et al.* (2000)
294	MA11	Loreto	07°21′S, 45°05′W	66	13	0.2	Eiten (1998)
295	MA12	Loreto	07°22′S, 45°06′W	54	6	0.11	R. *et al.* (2001)
296	MA13	Loreto	07°20′S, 45°09′W	50	1	0.02	R. *et al.* (2001)
297	MA14	Loreto (Fazenda Morro)	07°23′S, 45°01′W	45	2	0.04	R. *et al.* (2001)
298	MA15	Loreto (Fazenda Morro)	07°20′S, 45°04′W	20	6	0.3	R. *et al.* (2001)
299	MA16	Loreto	07°21′S, 45°05′W	40	7	0.17	R. *et al.* (2001)
300	MA17	Pé de Galinha	07°45′S, 45°50′W	62	10	0.16	R. *et al.* (1996)
301	MA18	Pedra Caída	06°57′S, 47°28′W	62	1	0.02	R. *et al.* (1996)
302	MA19	Rio Balsinha	07°30′S, 46°05′W	43	1	0.02	R. *et al.* (1996)
303	MA20	São João dos Patos	06°32′S, 43°31′W	38	2	0.05	R. *et al.* (2001)
304	MA21	Tasso Fragoso	08°26′S, 45°48′W	60	3	0.05	R. *et al.* (2001)
305	CE01	Chapada do Araripe	07°17′S, 39°29′W	44	0	0	R. *et al.* (2001)
306	CE02	Sertão de Salgado	06°38′S, 39°30′W	20	2	0.1	Figueiredo (1987)
307	PI01	Corrente	10°28′S, 45°10′W	30	10	0.33	R. *et al.* (2001)
308	PI02	Corrente	10°05′S, 45°15′W	36	0	0	R. *et al.* (2001)
309	PI03	Fazenda Piloto	06°36′S, 42°16′W	69	4	0.06	Castro (1994a)
310	PI04	Gilbués	09°44′S, 45°23′W	55	3	0.05	R. *et al.* (2001)
311	PI05	Gilbués	09°17′S, 45°35′W	41	0	0	R. *et al.* (2001)
312	PI06	Santo Filomena	09°14′S, 45°43′W	44	12	0.27	R. *et al.* (2001)
313	PI07	Uruçuí-Una	08°50′S, 44°10′W	37	2	0.05	Castro (1986)
314	PA01	Alter do Chão	02°36′S, 54°56′W	49	2	0.04	Sanaiotti (1991), Branch & Silva (1983), Miranda (1993)
315	PA02	Ariramba	01°10′S, 55°35′W	24	0	0	Egler (1960)
316	PA03	Campo de Joanes, Marajó	00°58′S, 48°34′W	15	0	0	Bastos (1984)
317	PA04	Fazenda Chocolate	08°21′S, 50°00′W	64	9	0.14	R. *et al.* (1996)

TABLE 1. (*Cont'd*)

No.	Code	Locality	Co-ordinates	NS	MS	MI	Reference
318	PA05	Fazenda de Prof. Getulinho	08°21′S, 50°06′W	66	8	0.12	R. *et al.* (1996)
319	PA06	Marajó	00°45′S, 48°30′W	20	0	0	Bastos (1984)
320	AM01	Humaitá	07°31′S, 63°00′W	17	0	0	Gottsberger & Morawetz (1986)
321	AM02	Humaitá	07°40′S, 63°00′W	46	1	0.02	Janssen (1986)
322	AP01	114km N of Macapá	00°46′N, 51°18′W	11	0	0	Sanaiotti *et al.* (1997)
323	AP02	36km N of Macapá	00°20′N, 51°05′W	15	0	0	Sanaiotti *et al.* (1997)
324	AP03	5km S of Calçoene	02°27′N, 50°33′W	6	0	0	Sanaiotti *et al.* (1997)
325	AP04	APA de Curiaú	00°20′N, 51°03′W	17	0	0	Sanaiotti *et al.* (1997)
326	AP05	EMBRAPA Stn., Macapá	00°37′N, 51°05′W	19	1	0.05	Sanaiotti *et al.* (1997)
327	AP06	Gleba de Pedreira	00°40′N, 51°45′W	19	0	0	Sanaiotti *et al.* (1997)
328	AP07	Tartarugalzinho	01°40′N, 50°50′W	7	0	0	Sanaiotti *et al.* (1997)
329	RR01	Alto Alegre	02°51′N, 60°57′W	2	0	0	Miranda (1997)
330	RR02	Alto Alegre	03°09′N, 61°08′W	5	0	0	Miranda (1997)
331	RR03	Boa Vista	03°20′N, 61°26′W	11	1	0.09	Takeuchi (1960)
332	RR04	Bonfim	03°16′N, 60°00′W	2	0	0	Miranda (1997)
333	RR05	Cantá	02°46′N, 60°36′W	8	0	0	Miranda (1997)
334	RR06	Cantá	02°39′N, 60°42′W	5	0	0	Miranda (1997)
335	RR07	Igarapé do Rébenque	04°26′N, 59°50′W	9	0	0	Miranda (1997)
336	RR08	Ilha do Maracá	03°22′N, 61°26′W	8	0	0	Milliken & Ratter (1989)
337	RR09	Lago Caracaranã	03°50′N, 59°46′W	10	0	0	Miranda (1997)
338	RR10	Lago Redondo	02°54′N, 60°28′W	8	0	0	Miranda (1997)
339	RR11	Maloca da Cachoeirinha	04°01′N, 59°54′W	6	0	0	Miranda (1997)
340	RR12	Maloca do Cajueiro	03°56′N, 59°37′W	7	0	0	Miranda (1997)
341	RR13	Maloca do Maracanã	04°21′N, 60°01′W	10	0	0	Miranda (1997)
342	RR14	Maloca do Napoleão	03°52′N, 60°01′W	5	0	0	Miranda (1997)
343	RR15	Mucajaí	02°40′N, 60°46′W	11	0	0	Miranda (1997)
344	RR16	Mucajaí	02°41′N, 60°47′W	7	0	0	Miranda (1997)
345	RR17	Mucajaí	02°40′N, 60°46′W	3	0	0	Miranda (1997)
346	RR18	Normândia	03°56′N, 59°51′W	5	0	0	Miranda (1997)
347	RR19	Normândia	04°03′N, 60°06′W	9	0	0	Miranda (1997)
348	RR20	Normândia	03°59′N, 59°36′W	8	0	0	Miranda (1997)
349	RR21	Normândia	03°54′N, 59°37′W	6	0	0	Miranda (1997)
350	RR22	Pedra Pintada	03°52′N, 60°54′W	7	0	0	Miranda (1997)
351	RR23	Roraima	03°48′N, 59°46′W	6	0	0	Dantas & Rodrigues (1982)

TABLE 1. *(Cont'd)*

No.	Code	Locality	Co-ordinates	NS	MS	MI	Reference
352	RR24	Serra da Lua	02°41′N, 60°23′W	6	0	0	Miranda (1997)
353	RR25	Serra da Lua	02°25′N, 60°06′W	7	0	0	Miranda (1997)
354	RR26	Serra da Lua	02°44′N, 60°33′W	8	0	0	Miranda (1997)
355	RR27	Serra da Lua	02°39′N, 60°18′W	8	0	0	Miranda (1997)
356	RR28	Vila Brasil	03°31′N, 61°24′W	14	1	0.07	Miranda (1997)
357	RR29	Vila Brasil	03°37′N, 61°30′W	7	0	0	Miranda (1997)
358	RR30	Vila da Água Fria	04°29′N, 60°18′W	7	0	0	Miranda (1997)
359	RR31	Vila do Contão	04°15′N, 60°30′W	4	0	0	Miranda (1997)
360	RR32	Vila do Contão	04°19′N, 60°29′W	10	0	0	Miranda (1997)
361	RR33	Vila do Socó	04°29′N, 60°12′W	5	0	0	Miranda (1997)
362	RR34	Vila do Surumu	04°10′N, 60°40′W	11	0	0	Miranda (1997)
363	RR35	Vila do Surumu	04°08′N, 60°45′W	12	0	0	Miranda (1997)
364	RR36	Vila do Surumu	03°55′N, 60°58′W	3	0	0	Miranda (1997)
365	RR37	Vila do Surumu	04°12′N, 60°49′W	8	1	0.12	Miranda (1997)
366	RR38	Vila do Surumu	04°05′N, 60°27′W	10	0	0	Miranda (1997)
367	RR39	Vila do Surumu	03°57′N, 60°26′W	4	0	0	Miranda (1997)
368	RR40	Vila do Surumu	04°09′N, 60°32′W	10	0	0	Miranda (1997)
369	RR41	Vila do Taiano	03°16′N, 61°16′W	5	0	0	Miranda (1997)
370	RR42	Vila do Taiano	03°22′N, 60°09′W	9	0	0	Miranda (1997)
371	RR43	Vila do Taiano	03°29′N, 61°16′W	4	0	0	Miranda (1997)
372	RR44	Vila do Taiano	03°20′N, 61°05′W	1	0	0	Miranda (1997)
373	RR45	Vila do Taiano	03°15′N, 61°15′W	3	0	0	Miranda (1997)
374	RR46	Vila do Uiramutã	04°35′N, 60°09′W	7	0	0	Miranda (1997)
375	RR47	Vila São Silvestre	02°50′N, 61°13′W	1	0	0	Miranda (1997)
376	RR48	Vila São Silvestre	02°50′N, 61°06′W	2	0	0	Miranda (1997)

47 surveys with an average of 61 species each shows that only 60 out of a total of 2860 species records fell into this category. In processing the results of other workers, some vaguely identified taxa which could not be related to species were also excluded from the matrix.

Soil samples were made for all surveys of the CMBBC project and a detailed analysis of the relationship of plant community with soil type will appear in a future publication. Such analyses have already been carried out for the surveys made in Goiás, Tocantins, Minas Gerais and Bahia, and they conform exactly with our previous observations on the occurrence of distinctive cerrado communities on dystrophic and mesotrophic soils (Ratter *et al.*, 1977; Furley & Ratter, 1988). In addition, detailed soil data are available for the great majority of our previous studies but there is no information for many sites surveyed by other workers. However, as in Ratter *et al.* (1996), presence of mesotrophic soils in areas where no soil analyses are available was inferred by the occurrence of indicator species (see Ratter *et al.*, 1973, 1977), marked in bold in Appendices 1 and 2. A 'mesotrophic index' (no. of mesotrophic soil indicator species/total no. of species) was calculated for all sites as a basis for comparison (see Table 1). While such an index is of some use, a

FIG. 1. Map of Brazil showing sites compared in the study. See Table 1 for full locality details. The number of sites appears fewer than the 376 localities in the table due to overlap of adjoining dots; the rectangular block is the Distrito Federal (DF) and represents 13 sites; the large dot in the Triângulo Mineiro represents 21 sites in the Municipality of Uberlândia. The shaded area shows the extent of the cerrado biome in Brazil. Letters are state abbreviations; those referred to in the text are: AM, Amazonas; AP, Amapá; BA, Bahia; CE, Ceará; GO, Goiás; MA, Maranhão; MG, Minas Gerais; MS, Mato Grosso do Sul; MT, Mato Grosso; PA, Pará; PI, Piauí; PR, Paraná; RO, Rondônia; RR, Roraima; SP, São Paulo; TO, Tocantins.

'Mesotrophic Importance Index' based on Importance Value Index, Cover Value Index or Basal Area would be much better, since in many mesotrophic communities the indicator species have high values for these parameters, while many other species present are relatively unimportant as constituents of the total vegetation. Unfortunately, however, data are not available to calculate a Mesotrophic Importance Index for most of the sites considered.

Floristic survey of the Conservação e Manejo da Biodiversidade do Bioma Cerrado (CMBBC) project

Since the results of this project form a vital part of this paper, it is appropriate to give a brief account of its aims and the techniques used. The object of the floristic survey of the project was to provide within a period of four years the maximum amount of data on woody cerrado vegetation for largely unsampled northern and central-western parts of the cerrado biome. Areas were targeted on the basis of previous lack of information or sometimes on indications of exceptional floristic diversity. The grid of 1° latitude × 1°30′ longitude used by the national RADAMBRASIL project (see Fig. 2) with, where possible, at least three sites in each rectangle, was used to obtain a spatial representation of the surveys. The first two areas targeted were the states of Mato Grosso do Sul (MS) and Tocantins (TO), where there was an extreme lack of existing data. Other areas were later included and in total 170 sites were surveyed (Ratter *et al.*, 2001), made up by state as follows (the figures in parentheses are those known to us as existing prior to the CMBBC surveys): Bahia 14 (2), Ceará 1 (1), Goiás 19 (15), Maranhão 13 (8), Mato Grosso 23 (19), Mato Grosso do Sul 31 (3), Minas Gerais 11 (57), Piauí 5 (13), Tocantins 43 (5), Rondônia 10 (1). Wherever possible, local experts worked with us in the surveys and their knowledge of regional geography and flora was invaluable.

A rapid survey technique was used to allow us to carry out so many surveys within a limited period. This was developed as a refinement of 'wide-patrolling' and bears some resemblance to 'caminhamento' (Filgueiras *et al.*, 1994). The adoption of this technique was based on our experience working as a large team in the states of Maranhão, Mato Grosso, Pará and Goiás in 1993. During this period groups of up to eight people worked on numerous transects and plots, while usually a single person carried out wide-patrolling of the same area. To our surprise, the teams of the transects/plot group never recorded a single species unnoticed by the wide-patroller, but on the other hand the latter frequently noted 50% more species than them. Thus wide-patrolling represents a particularly effective method for producing comprehensive floristic data rapidly, providing, of course, that patrollers have a very good knowledge of the flora.

The method used was refined by introducing a timing element so that a species number/time curve could be produced, giving a quantitative measurement for judging the correct time to end a survey. The survey was carried out usually by a team of three or four, one of whom acted as recorder and also registered 15-minute intervals, while the others shouted out the species observed. Typically species recording occupied four to eight 15-minute intervals, according to the floristic diversity, size and topography of the area. As previously discussed, all species which can attain a height of at least 1.5m and basal diameter of 3cm were recorded (even if the only individuals present were smaller than this). Our survey technique is not tied to a specific area (often the finding of suitable patches of cerrado in targeted areas was fortuitous and we had to be pragmatic about our choice); however, areas too small to provide communities representative of a good range of species diversity were avoided.

FIG. 2. Survey grid of 1° latitude × 1°30′ longitude, as used by the national RADAMBRASIL survey. Areas of cerrado and Amazonian savanna covered by the CMBBC and other surveys are in black; cerrado biome is in grey. Outlying sites are in disjunct cerrado islands or in Amazonian savanna. State abbreviations as in Fig. 1.

At the suggestion of Dr C. Proença, we carried out a trial of the method to judge its efficiency before applying it in the CMBBC fieldwork. This consisted of re-surveying an area of cerrado *sensu stricto* at Fazenda Água Limpa (ecological reserve of the University of Brasília) which had been studied using plots, wide-patrolling (and general collecting) in 1976–77 (Ratter, 1986). A team of five took $1\frac{3}{4}$ hours to find 68 of the 69 species previously recorded (one species, *Ferdinandusa elliptica*, originally represented by only two specimens was not refound), while three additional species were found. The latter were adventives which must have entered the area in the 20 years since the first survey, and one of these, *Aegiphila lhotskiana*, was quite frequent.

Data analysis

The floristic matrix was compiled using EXCEL, with the data entered in simple binary form, i.e. presence/absence. Two multivariate techniques were used to analyse these data in an attempt to identify floristic patterns within the matrix, the methodology following closely that of Oliveira-Filho & Ratter (1995) and Ratter *et al.* (1996). The two techniques were (a) a divisive hierarchical classification by Two-Way Indicator Species Analysis (TWINSPAN) (Hill, 1979), and (b) an agglomerative hierarchical classification by UPGMA (Unweighted Pair-Groups Method using Arithmetic Averages) using the Sørensen Coefficient of Community (cc) as a measure of similarity (Kent & Coker, 1992). The versions of these analytical programs used were contained in the statistical package for Windows PC-ORD (Version 4.17) (McCune & Mefford, 1999).

In total the floristic matrix comprised 951 species recorded at 376 sites. This was analysed four times using both multivariate techniques. The first approach included all species present in the matrix, and in the second the data set was modified by the removal of the 334 unicate species (occurring at only one area), following the methodology described in Ratter *et al.* (1996). The results of these first two approaches were essentially the same, although the analyses presented here are those with the unicates excluded as these illustrate clearer patterns within the data set. The reasons for this are outlined on p. 82.

In addition, two further analyses were run to investigate the effect of the presence of mesotrophic indicator species on the floristic patterns indicated by the study. All sites were first classified as either mesotrophic or dystrophic based on the presence or absence of mesotrophic indicator species (Ratter *et al.*, 1977; Ratter & Dargie, 1992), and the data subsequently analysed a further twice. The first ran both TWINSPAN and UPGMA analyses of a data set of only those sites classified by the authors as strongly mesotrophic, and the second of sites regarded as dystrophic. The patterns illustrated did not vary significantly from those revealed by the full data set and so are not presented here.

Results and Discussion

Species diversity

A total of 951 species was recorded in the 376 areas, of which 334 (35%) are unicates, i.e. occur at only a single locality. Appendix 1 gives a list of species occurring at more than one site and the number of sites at which they occurred, while Appendix 2 lists the unicates. Space does not allow the table of species occurrence at all sites to be reproduced here but copies are available from the authors and those for the 170 surveys of the CMBBC project are given in Ratter *et al.* (2001).

The first division of both the TWINSPAN and UPGMA analyses (Figs 4 and 7) separated the 376 areas into Amazonian savanna sites (more or less those north of

the river Amazon) and the core cerrado area with its related outlier sites. These two groups will be considered separately in the following account.

Disjunct Amazonian sites

The disjunct Amazonian sites, with the exception of Alter do Chão (Pará) and one site at Humaitá (Amazonas), represent a low diversity savanna with a total species list of 117 spp. (marked A in Appendices 1 and 2). Of these, 77 (marked W and C in Appendices 1 and 2) are widespread species common in the core cerrado area. No less than 59 species (50%) are unicates occurring at only a single site, while 81 (69%) have three or fewer occurrences. By far the commonest species are *Byrsonima crassifolia*, occurring at 47 sites (80%), and *Curatella americana* at 48 (81%). The commonest species in the 58 sites are *Anacardium occidentale*, *Bowdichia virgilioides*, *Byrsonima coccolobifolia*, *B. crassifolia*, *B. verbascifolia*, *Casearia sylvestris*, *Curatella americana*, *Erythroxylum suberosum*, *Genipa americana*, *Himatanthus articulatus*, *Hirtella ciliata*, *Ouratea hexasperma*, *Palicourea rigida*, *Psidium guineense*, *Roupala montana*, *Salvertia convallariodora*, *Tocoyena formosa* and *Xylopia aromatica*. Some of these species, e.g. *Byrsonima crassifolia* and *Curatella americana*, are very resistant to high water-tables for part of the year so are characteristic of hydrologic savannas and/or have weedy tendencies, e.g. *Genipa americana* and *Xylopia aromatica*. Species indicating mesotrophic soils are almost completely absent from the disjunct Amazonian sites (see number of mesotrophic species and the mesotrophic indices in Table 1).

Core area and outliers

In total 914 species were recorded for the 315 areas comprising the core cerrado and its outliers (the latter excluding Alter do Chão, Pará and one site at Humaitá, Amazonas, which, however, have strong affinities with the core area). Of these, only 300 species occur at eight or more sites (i.e. $\geq$2.5% of the total), while the remaining 614 species, including 309 unicates, are very rare. The appendices give figures for site occurrence of all species and Fig. 3 gives numbers in percentage bands. As in our previous studies (Ratter & Dargie, 1992; Ratter *et al.*, 1996), no species occurs at all sites, and once again the most widespread is *Qualea grandiflora* with 274 occurrences (85% of the total). Only the 38 species listed in Table 2 were recorded for 50% (158) or more of the sites; figures for the same species obtained in our previous works are also given. The agreement of the frequencies of the commonest species in the present work and in Ratter *et al.* (1996) is surprisingly high, despite a more than threefold increase in areas sampled, and seems to indicate a consistent suite of important species. The only species recorded for $\geq$50% of surveys in Ratter *et al.* (1996) and not reaching this level in the present study is *Copaifera langsdorfii* with 45% occurrence. There is also a very high correspondence with the commonest

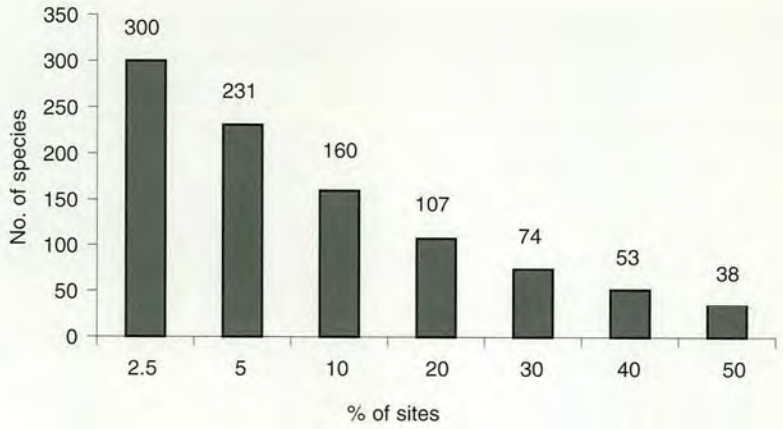

FIG. 3. Species occurrence vs. percentage of sites in cerrado core area (e.g. 38 species occur at ≥50% of sites, while 300 species occur at ≥2.5%).

TABLE 2. Species occurring at 158 (50%) or more sites of core area and outliers. The figures indicate the percentage of sites where the species occur, with equivalent values for Ratter & Dargie (1992) and Ratter *et al.* (1996), respectively, in parentheses. Figures from these previous studies were recalculated to eliminate records from disjunct Amazonian savannas

Species	%	Species	%
Qualea grandiflora	85 (96, 96)	*Byrsonima crassa*	60 (41, 47)
Q. parviflora	78 (75, 71)	*Himatanthus obovatus*	59 (41, 45)
Bowdichia virgilioides	77 (79, 76)	*Vatairea macrocarpa*	59 (58, 48)
Dimorphandra mollis	74 (71, 77)	*Davilla elliptica*	58 (66, 47)
Lafoensia pacari	74 (71, 62)	*Machaerium acutifolium*	58 (62, 65)
Connarus suberosus	73 (75, 71)	*Tocoyena formosa*	58 (75, 58)
Hymenaea stigonocarpa	73 (62, 78)	*Diospyros hispida*	57 (50, 45)
Kielmeyera coriacea	70 (62, 77)	*Salvertia convallariodora*	56 (54, 53)
Tabebuia aurea	67 (75, 56)	*Astronium fraxinifolium*	55 (58, 52)
T. ochracea	66 (37, 57)	*Sclerolobium aureum*	55 (58, 47)
Byrsonima coccolobifolia	65 (83, 71)	*Xylopia aromatica*	55 (58, 57)
Pouteria ramiflora	65 (62, 60)	*Annona coriacea*	54 (42, 48)
Casearia sylvestris	64 (71, 71)	*Hancornia speciosa*	53 (42, 51)
Roupala montana	62 (54, 62)	*Ouratea hexasperma*	53 (42, 41)
Acosmium dasycarpum	62 (58, 60)	*Plathymenia reticulata*	53 (58, 47)
Curatella americana	62 (75, 71)	*Aspidosperma tomentosum*	51 (65, 49)
Erythroxylum suberosum	62 (71, 54)	*Qualea multiflora*	51 (61, 63)
Caryocar brasiliense	61 (75, 78)	*Byrsonima verbascifolia*	50 (61, 55)
Brosimum gaudichaudii	60 (54, 62)	*Eriotheca gracilipes*	50 (50, 37)

species recorded in Ratter & Dargie (1992), despite the fact that the data in that work came from less than 10% of the number of surveys reported here.

The 300 species occurring in ≥2.5% of the surveys represent the most common

and widespread woody species of at least 75% of the cerrado region. There should be added to them a further approximately 50 species relatively common in the São Paulo cerrados but apparently rare or absent elsewhere (Durigan, pers. comm.), 40 of which are registered as rare in our species matrix (Appendices 1 and 2) while the others are unrecorded. This therefore indicates a group of about 350 species which overwhelmingly dominates the woody vegetation of cerrado *sensu lato* throughout the cerrado biome. However, the total woody flora of cerrado *sensu lato* is much greater than this (as demonstrated by the 951 species recorded in this paper) as it includes many rare 'characteristic' species, together with accessory and ecotonal elements. We are reserving detailed consideration of our results on cerrado species diversity for a future publication.

It is interesting to compare our conclusion that the woody vegetation of cerrado *sensu lato* is dominated by some 350 species with recent results from the Amazonian forest. Pitman *et al.* (2001) have studied dominance and distribution of tree species in great areas of *terra firme* forests in Ecuador and Peru. They found oligarchies of 150 species dominating thousands of square kilometres of forest in each country, although the total species diversity was much greater because of the huge numbers of rare species present. This bears a strong resemblance to the situation in the cerrado, although the dominance of our 350 species-group is much stronger than that of the oligarchies encountered in Amazonian forest.

Alpha diversity

Although a total of 914 species was recorded in the 315 areas (i.e. all those analysed but excluding the disjunct Amazonian sites) and we regard about 350 as relatively common characteristic species of cerrado *sensu lato*, the number of species occurring in the communities at any given site (alpha diversity) is very much lower. In fact, it is very rare to find over 100 species in any community, other than in sites of very large area and/or where intensive studies have been conducted over a long period, thus allowing extreme rarities to be encountered. The species richness of communities varies considerably throughout the cerrado region, but since methods of collecting data have differed considerably, particularly in size of areas studied, it is possible to give only some very general observations. Comparing our CMBBC project results of species per community for 170 rapid survey sites shows 28–55 (average 47) spp. for Bahia (14 sites), 65–91 (av. 79) for Goiás (19 sites), 33–70 (av. 54) for northern Minas Gerais (11 sites), 19–79 (av. 49) for Maranhão (13 sites), 41–106 (av. 65) for Mato Grosso (23 sites), 28–76 (av. 58) for Mato Grosso do Sul (31 sites), 30–55 (av. 41) for southern Piauí (5 sites), 23–97 (av. 72) for Tocantins (43 sites), 21–63 (av. 42) for Rondônia (10 sites), and 20–44 (av. 32) for Ceará (2 sites). We have noticed particularly high species richness in the Araguaia and Tocantins drainage regions of Goiás, Tocantins and Mato Grosso, and in the Xingu drainage of Mato Grosso. There are also many records of high alpha diversity in the São Paulo cerrados.

Differences in species richness are not always obvious to the observer simply looking at the overall appearance of areas of cerrado. Thus magnificent cerrado landscapes in Maranhão and Piauí often contain about 50 species, a much lower figure than is general in parts of Goiás and Tocantins. However, this does not indicate by any means that the former are any less worthy of conservation, since they have an extremely interesting flora and provide a unique representation of regional biodiversity. As stressed by Bates & Demos (2001), when determining conservation value it is a gross oversimplification to pit areas against one another on comparative biodiversity values.

As we have already discussed (e.g. Ratter *et al.*, 2000a), diversity is often lower in areas with richer soils, where dominance of characteristic 'indicator' species such as *Callisthene fasciculata*, *Magonia pubescens*, *Terminalia argentea*, *Luehea paniculata*, etc., occurs. Examples of such sites occur throughout a great part of the cerrado region, for example at Poconé (Mato Grosso, MT31) 34 spp., Carolina (Maranhão, MA06) 21 spp., Corrente (Piauí, PI01) 30 spp., and 27–36 spp. at a number of the Rondônia sites on *solo chocolate* – see below.

Mesotrophic indices

As shown in Table 1, there are great differences in mesotrophic indices between sites and regions. Thus in São Paulo state the figures are consistently low, indicating the prevalence of dystrophic soils, while in most other areas of the core cerrado region there is considerable variation, often reflecting the occurrence of ancient, leached dystrophic soils on the chapadas, in contrast to regions where erosion has cut valleys into lower, more mineral-rich strata. Mato Grosso do Sul is the state where we found mesotrophic soils most common in cerrado: 20 of the 33 sites analysed had mesotrophic indices greater than 0.10.

An interesting situation occurs in Rondônia where mesotrophic cerrados occur on the widespread *solo chocolate*. This soil is named for a mineral-rich, shallow, chocolate-brown pan which impedes drainage and is found at varying depths in the soil horizon. The staff of EMATER-RO (the state agricultural extension service) informed us that this type of soil extends from Pimenta Bueno to Guaporé and right into Bolivia. On the other hand, the well-drained, sandy soils of the state carry a dystrophic cerrado. The mesotrophic index of cerrados on the *solo chocolate* is 0.17 to 0.22, while on the sandy, well-drained soils it is 0.0.

We plan to give further details of both mesotrophic indices and Rondônian cerrados in future publications.

Multivariate Analyses

The multivariate analyses of the floristic data show a great deal of coincidence in the patterns derived from both techniques used. A detailed description and discussion of the results obtained are given below.

1. Divisive hierarchical classification (TWINSPAN) site hierarchy

Figure 4 shows eight groups which we regard as meaningful. Of these, Group 8 (the Amazonian savanna sites) was split off at the first division, Group 1 (the most southern sites) at the third division, while the other six groups result from four levels of division. Details of the divisions and the indicator species on which they are partly based are too lengthy to reproduce here, but are available from the authors. The groupings produced by the analysis are mapped in Fig. 5.

Interpretation of grouping. The main features of groups and group sets are as follows:

Group 1: This is a geographically very natural group consisting of 18 São Paulo sites (all of those included in the analysis, apart from one of the Itirapina surveys (Gianotti & Leitão Filho, 1992)), three sites from the Rio Grande region of southern Minas Gerais, close to the São Paulo border (Carvalho, 1987), and the single Paraná site. All of the sites show low occurrence of mesotrophic indicator species. This is a very distinct southern group corresponding to Group 2 of Ratter *et al.* (1996).

Group 2: Like the previous, this is also a clearly natural group. It consists of 24 sites from Minas Gerais, mostly situated in the southern or central part of the state. The number of mesotrophic indicator species occurring in most of the sites is relatively low. The group corresponds to Group 3 recognized by Ratter *et al.* (1996).

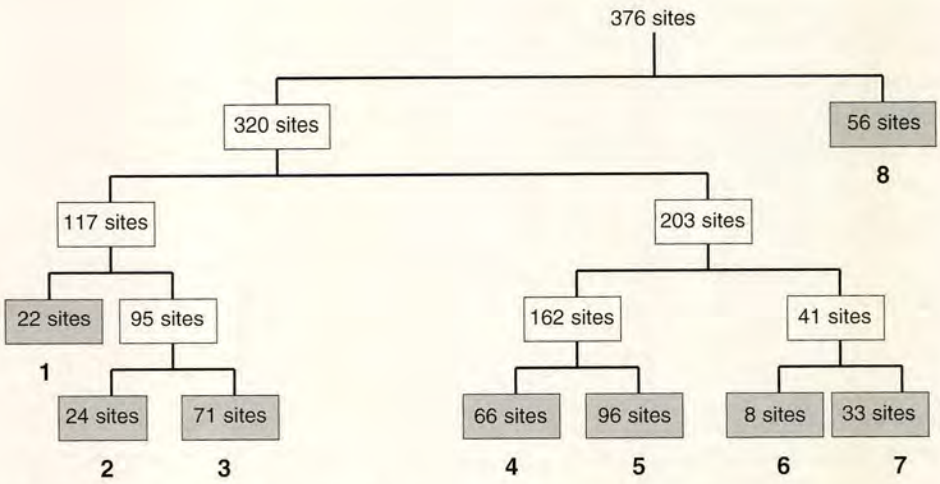

FIG. 4. Site hierarchy derived from the TWINSPAN analysis. 1, Southern dystrophic sites (SP, MG, PR); 2, Southeastern, mainly dystrophic sites (MG); 3, Broad geographical grouping with strong dystrophic tendencies (MG, DF, GO, MT, MS, BA, PA, RR, SP, TO); 4, Predominantly northeastern group, with some outliers (MA, TO, BA, PI, CE, GO, MG, PA, MT, RO); 5, Central-western mesotrophic group (TO, MT, GO, MS, (MG)); 6, Mesotrophic far western sites (RO); 7, Widely spread sites with strong mesotrophic tendencies (MS, GO, MT, MA, CE, PI, TO); 8, Disjunct Amazonian sites. State abbreviations as in Fig. 1.

Group 3: This constitutes a large group of 71 mainly dystrophic sites, many aspects of which are difficult to interpret. It includes all 13 Federal District sites, 33 from Minas Gerais, and some with a far western distribution from Rondônia, Mato Grosso de Sul and even Humaitá, Amazonas (Janssen, 1986). Other sites are from Goiás, Tocantins, the far west of Bahia, Itirapina (São Paulo), and two grossly misclassified sites from Roraima which both contain only a single woody species!

Clearly, this group is partly based on natural affinities, of which the grouping of all Federal District sites and large number of those from Minas Gerais is an example. Some others, particularly those from Roraima, are certainly misclassified (and no attempt has been made to map them).

Group 4: This is a large group of 66 sites with a strongly northeastern distribution and few mesotrophic indicator species. It contains 13 (out of a total of 17) Bahia sites, a Ceará site from the Chapada do Araripe, five from the extreme north of Minas Gerais, 20 (out of 21) from Maranhão, five (out of seven) from Piauí, 16 from Tocantins, and three in Pará (one of which is certainly misclassified). There are also two sites in Mato Grosso (MT17 and MT20 of Table 1) and one in Rondônia which do not seem to fit well into the group.

Group 5: This represents a huge group of 96 sites, all with mesotrophic indicator species, which stretch as a central-western band running across the states of Mato Grosso do Sul, Mato Grosso, Goiás and Tocantins, with two outliers in NW Minas Gerais and a single in Pará, very close to the Tocantins border. It seems to represent a natural grouping, associated with a central-western distribution and widespread occurrence of mesotrophic soils.

Group 6: A small very natural group of eight mesotrophic sites in Rondônia, characterized by presence of indicators such as *Callisthene fasciculata*, etc., and mostly associated with strongly mesotrophic *solo chocolate* characteristic of a large area of the state (see p. 79).

Group 7: A group of 33 strongly mesotrophic sites, including the two with the highest mesotrophic indices in the whole study: MT31 (Poconé) and MS23 (Maracaju), the latter really more properly classified as mesophytic forest than mesotrophic cerradão. These sites are mainly of mesotrophic facies cerradão, and Mato Grosso do Sul, where this community is very widespread, is particularly well represented.

Group 8: This consists of the 56 Amazonian savanna sites which were separated from all the others at the first level of division. It contains all Roraima sites apart from two misclassified in Group 3, all Amapá sites, two from Pará, and one from Humaitá, Amazonas. This is clearly a natural group of species-poor Amazonian sites, with woody species varying in number from 19 to one, and diversity characteristics which have already been discussed on p. 76. However, two disjunct Amazonian sites have much higher species diversity and are classified as having affinities to the core area: Alter do Chão (PA01) falls into northeastern Group 4 and Humaitá (AM02) into Group 2.

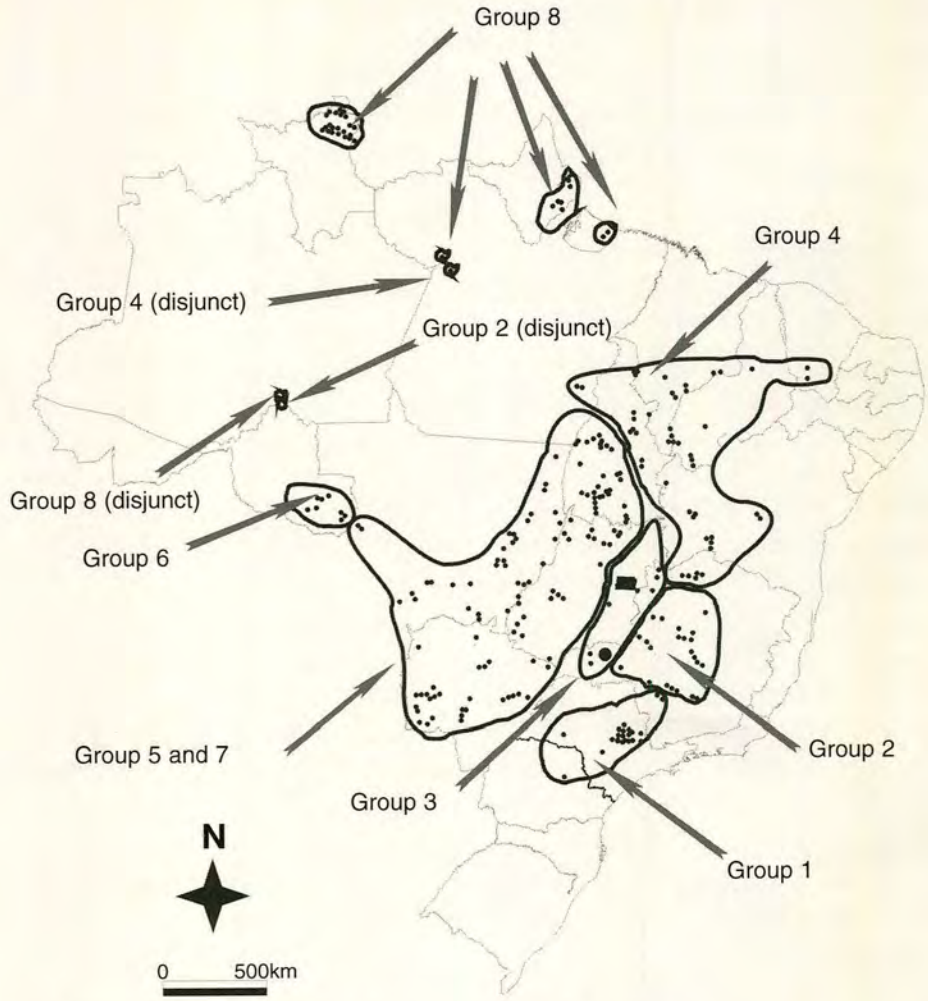

FIG. 5. Map of Brazil showing the groups defined by TWINSPAN.

2. Agglomerative hierarchical classification (UPGMA)

Analyses were made using the same data matrix as for TWINSPAN. Thus we used a slightly modified Sørensen Coefficient of Community since unicate species (occurring at only a single site) were excluded. We decided on this as in our previous studies the matrix minus unicates was undoubtedly superior in geographical fit and other factors to the complete matrix. The explanation of this is perhaps that the inclusion of unicates produces irrelevant 'noise', since many of them are undoubtedly 'rogues', including, for instance, non-cerrado species from adjacent vegetation types (gallery forests, etc.), misidentifications, unrecognized synonyms, etc.

Figure 7 shows a dendrogram derived from the UPGMA analysis and Fig. 6 is a

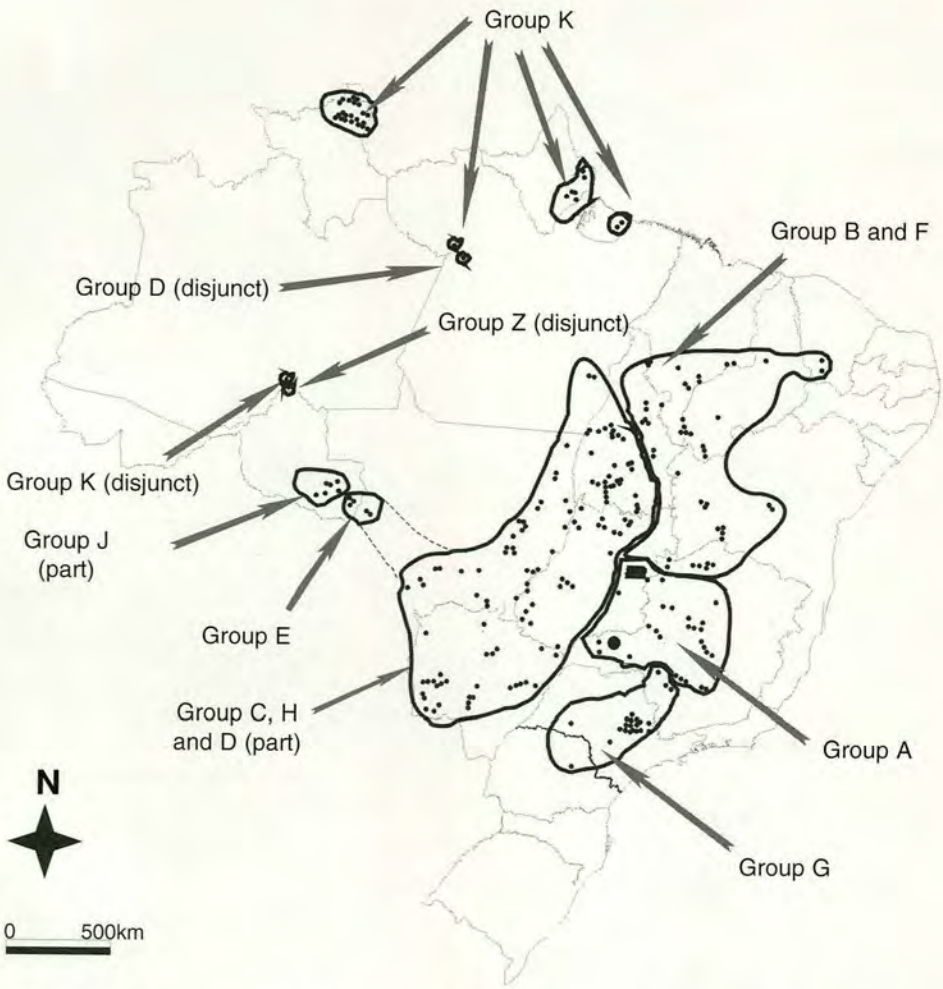

FIG. 6. Map of Brazil showing the groups defined by UPGMA.

map based on it. As the following account demonstrates, there is considerable correspondence of the results of the UPGMA and TWINSPAN analyses, as shown by the similarity of the two maps (Figs 5 and 6). Similar agreement of the results from these two methods of analysis occurred in Ratter *et al.* (1996), although in that work the data set was smaller and less complicated and the correspondence closer.

Group G consists of the southern sites and corresponds to Group 1 of the TWINSPAN classification almost exactly. The group contains all São Paulo sites, the three southern Minas Gerais sites from the Rio Grande region close to the São Paulo border (Carvalho, 1987) and the single record from Paraná. However, two further south Minas Gerais sites from São Roque de Minas are also included in the

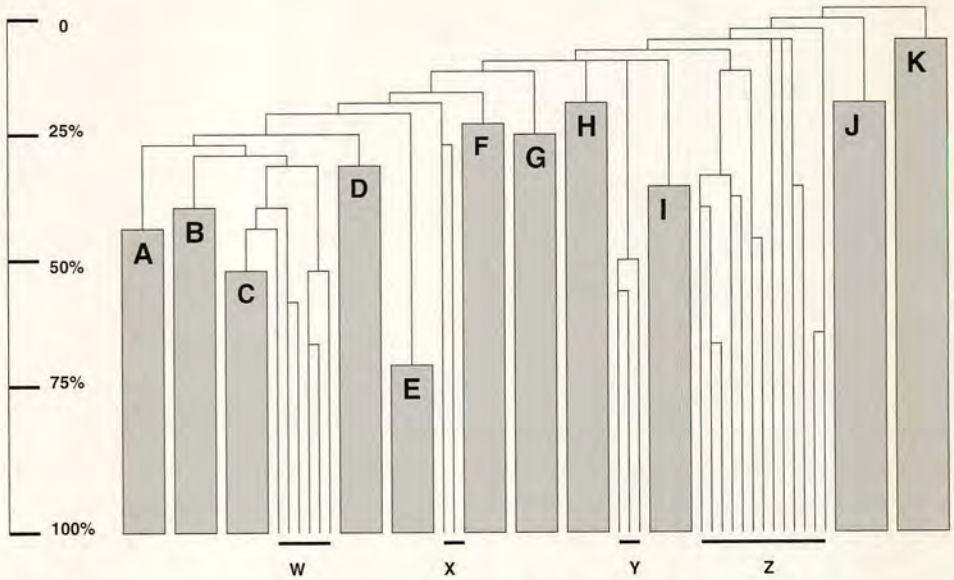

FIG. 7. Similarity dendrogram yielded by UPGMA Sørensen Coefficients of Community. A, Southeastern and Federal District sites (MG, DF, GO); B, Northeastern sites (TO, MA, BA, MG, PI); C, Central-western sites with strong mesotrophic tendencies (MS, MT, GO, TO, PA, MG); D, Mixed geographical group (PA, MT, TO); E, Far western dystrophic sites (RO, MT); F, Mainly northeastern mesotrophic grouping (MA, PI, BA, MG, MT); G, Southern sites (SP, MG, PR); H, Western mesotrophic sites (RO, MS); I, Southeastern sites (MG); J, Far western mesotrophic sites (RO); K, Disjunct Amazonian savanna sites; W, X, Y, Z, Small mixed groupings. State abbreviations as in Fig. 1.

UPGMA classification. These sites fell into the large TWINSPAN Group 3, but the indication of their affinity by UPGMA seems more appropriate. As was concluded by Ratter *et al.* (1996), the southern group is clearly a very natural one, stretching from Paraná, across São Paulo, to the south of Minas Gerais (see Fig. 6).

Group A consists of all 13 Federal District sites, one from Goiás close to the Federal District, and 31 from Minas Gerais, particularly from the central and southern parts of the state. It should also be related to the rather anomalous Group I consisting of 20 sites in the municipality of Uberlândia, Minas Gerais, reported by Araújo *et al.* (1997). These sites all showed low diversity, ranging from 20 to 37 species, almost undoubtedly because of the employment of a very small representative sample (30 Point-Centered Quarter points, i.e. 120 individuals), and gave the impression of a very natural, almost endemic group for the Triângulo Mineiro. However, when the floristic lists of all these sites were added together they provided a total list of 99 species which we noticed bore a strong resemblance to that of the typical cerrado flora of the Federal District. Comparison of this composite list with that of Fazenda Água Limpa, Federal District (Ratter, 1986) gave a Sørensen Coefficient of Community of 0.84, thus demonstrating a very high floristic affinity between the

Federal District and Uberlândia. Group A, with Group I combined, corresponds more or less to the core Federal District and Minas Gerais component of Group 3 of the TWINSPAN classification, but without the outliers and obviously misclassified sites of the TWINSPAN group.

Group B consists of 46 sites with a northeastern affinity, 13 from Bahia, 17 from Maranhão, six from the extreme north of Minas Gerais, three from Piauí, and seven from Tocantins. In addition, there is a probably misclassified site from southern Minas Gerais (MG37, Prudente de Moraes). Thirty-two of these sites are in the large TWINSPAN Group 4, but the UPGMA group, unlike the TWINSPAN, does not include outliers from, for instance, Mato Grosso, Pará and Goiás.

Group C consists of 116 sites concentrated in Goiás, Mato Grosso do Sul, Mato Grosso and Tocantins, with two sites in northwestern Minas Gerais and two in Pará very close to the border with Tocantins. It has 92 sites in common with the 96 sites of TWINSPAN Group 5 with which it clearly equates. As already stated, this group is generally characterized by the presence of mesotrophic indicator species and seems to represent a natural grouping, probably associated with the widespread occurrence of mesotrophic soils. It can be described as a central-western group with strong mesotrophic tendencies.

Group J forms another natural group and consists of nine far western mesotrophic sites, six of them from Rondônia associated with mesotrophic *solo chocolate* (forming Group 6 of the TWINSPAN classification) and three sites (MS23, MT31 and MT32 of Table 1) with the highest mesotrophic species indices found in the study, all of which were placed in Group 7 of TWINSPAN.

Group H is yet another natural group, of 18 western mesotrophic sites (15 from Mato Grosso do Sul, two from Mato Grosso, and one from Rondônia). It forms approximately half of the TWINSPAN Group 7, while the other half of the sites of this TWINSPAN group fall into UPGMA Group C (nine western sites with strong mesotrophic tendency), Group J (three far western mesotrophic sites), and Group F (nine northeastern sites, again with strong mesotrophic character). Clearly this group is linked to the presence of strongly mesotrophic soils.

Group F consists of nine northeastern sites with strong mesotrophic character (two from Bahia, two from Maranhão, three from the extreme north of Minas Gerais, and two from Piauí). As already mentioned, it equates with part of the mesotrophic TWINSPAN Group 7.

Group E consists of five far western dystrophic sites (three in Rondônia and the other two in Mato Grosso close to the border between the two states). These sites fall into the western part of the large TWINSPAN Group 3.

Group D is also small and western, consisting of nine sites. Six of these lie along the eastern Mato Grosso frontier, in the area of the Pantanal do Rio das Mortes, and are classified by TWINSPAN in the large widespread central-western Group 5. The

or less unites TWINSPAN Groups 2 and a part of 3; we feel that the merger of these groups gives a more workable classification.

North and northeastern sites. These correspond approximately to TWINSPAN Group 4 and UPGMA Groups B and F and include sites from Bahia, Ceará, the extreme north of Minas Gerais, Maranhão, Piauí, Tocantins, and one site in Pará very close to the Tocantins border. They equate, at least in part, to the northern sites of Ratter *et al.* (1996), although there has been a huge increase in information available since that publication.

Central-western sites. This is made up of a huge swathe of sites running across the states of Mato Grosso do Sul, Mato Grosso, Goiás, Tocantins, and into Pará close to the Tocantins border. It is the group which is classified as Group 5 by TWINSPAN (96 sites) and Group C by UPGMA (116 sites). As previously mentioned, this group contains sites with many mesotrophic indicator species and thus is frequently characteristic of richer cerrado soils.

Widely spread sites of strong mesotrophic character. This group occurs in Ceará, Goiás, Mato Grosso, Piauí and Tocantins, but is particularly well represented in Mato Grosso do Sul where the original dominant vegetation of large areas was mesotrophic facies cerradão with *Terminalia argentea* as perhaps the most characteristic tree. It corresponds to TWINSPAN Group 7 and much of UPGMA Group H (see discussion under TWINSPAN, p. 81, and UPGMA, p. 85). The group is probably largely linked to soil factors and much of its range falls within that of the large central-western group.

Far western mesotrophic sites. This is a small set of 10 sites occurring on mesotrophic soils in Rondônia, Mato Grosso do Sul (Maracaju) and on capões (small isolated forest patches) in the Mato Grosso Pantanal at Poconé. It forms Group 6 of TWINSPAN and Group J of UPGMA (see discussion on pp. 81 and 85), and is closely related to the previous group above. Clearly the dominant factor in determining the characteristics of this floristic group is the presence of mesotrophic soils.

Disjunct Amazonian sites. As already discussed, these form a very distinct group in both TWINSPAN and UPGMA classifications.

Thus we recognize six geographical subsets within the immense cerrado region, albeit that several show considerable overlap (so much so that it was not practical to place the 'widely spread sites of strong mesotrophic character' on the map), and, in addition, a very distinct Amazonian savanna group. Essentially we are describing regional variation within a vegetation continuum, although the floristic heterogeneity of different parts of this continuum can be very great. To some extent these regions can be recognized in the field by the few people familiar with the whole of the cerrado region. On a few occasions our team has noticed differences during journeys and remarked on 'the flora becoming like that of the Federal District here', or 'this reminds me of Xavantina', or 'quite a strong southern element here'. It would be

interesting to give experienced people unlabelled representative herbarium collections and ask them to identify the geographic source, or to transport them in a windowless aircraft to identify their destination on the basis of cerrado floristics! The clues lie in characteristic marker species, for example *Hirtella ciliata*, *Caryocar cuneatum* and *Parkia platycephala* in north and northeastern sites, *Vochysia gardneri*, *Platonia insignis* and *Martiodendron mediterraneum* in the northeast (the latter pair rather improbable-looking cerrado trees), *Mezilaurus crassiramea*, *Aspidosperma multiflorum* and *Eschweilera nana* in central-western sites, and *Acosmium subelegans*, *Campomanesia adamantium*, *Erythroxylum cuneifolium*, *Gochnatia* spp. and many *Lauraceae* in southern sites, to name but a few. Detailed consideration of regional floristic variation is being reserved for a future publication.

General Discussion and Conclusions

The analysis of the greatly increased data set now available strengthens the knowledge of the distribution patterns of the flora of the cerrado biome shown by our previous work (Ratter & Dargie, 1992; Ratter *et al.*, 1996) and by other workers (Castro, 1994a,b; Castro & Martins, 1999). As in Ratter *et al.* (1996), there is a close correspondence between the results of TWINSPAN and UPGMA analyses, and this has allowed us to construct a fairly congruent phytogeographic scheme (pp. 87–88, Fig. 8).

The most striking feature of the analyses is the separation at first division of the species-poor Roraima and the majority of the other isolated Amazonian savannas from the central continuous cerrado core and its more southern outliers. Our observations of the latter agree quite well with those of Castro (1994a,b) and Castro & Martins (1999) who recognize three supercentres of biodiversity within the cerrado biome on the basis of the analysis of 145 surveys. These are:

(a) São Paulo state (where two subdivisions, SP1 and SP2, were recognized, with cerradão and campo cerrado respectively as the dominant components).
(b) Planalto central with four subdivisions (PC1, PC2, PC3 and the Pantanal).
(c) A northeastern group.

These more or less correspond in our classification on pp. 87–88 to:

(a) The southern sites.
(b) The central and southeastern and the central-western sites and, to some extent, the widely spread mesotrophic sites.
(c) Our north and northeastern sites.

The southern sites form a very distinct group in our analyses and those of Castro (1994a,b) and Castro & Martins (1999). Further information is available from very recent work of Durigan (2001) who in a comprehensive study surveyed and compared by multivariate analyses no less than 86 areas in the state of São Paulo. Durigan *et al.* (in press) have also compared their floristic data with species lists from surveys of 137 areas made by other workers in the states of Paraná, Minas Gerais, Mato

Grosso do Sul, Goiás and Mato Grosso. As in the work of Castro (1994a,b) and Castro & Martins (1999), their results demonstrate that two physiognomically correlated groups occur in the São Paulo cerrado flora: one, predominantly of cerrado ralo (campo cerrado) from the centre to the north and northeast of the state, shows affinity with areas in the south of Minas Gerais and Mato Grosso do Sul, but is very distinct from those of Goiás, while the other, of cerradões from the northwest, shows stronger separation from all cerrados external to the state.

Castro (1994a,b) and Castro & Martins (1999) correlate their groups and 'supercentres of biodiversity' with climatic factors of the environment. They point out that across the cerrado region soil hydric deficiency increases in a southeast–northeast direction, as does mean temperature, and suggest that species distributions can be correlated with this trend. They state that two climatic barriers cut across the region of the cerrados: occurrence of frosts to the south of 20°S, and of severe droughts to the north and east of 15°S, 45°W. In addition, altitude reinforces the separation of these supercentres. These conclusions are undoubtedly valid and support, with enormously more data and detail, the very preliminary observations of Ratter & Dargie (1992) of major gradients correlated with latitude and to some extent longitude. The third, and strongest, determining factor observed by Ratter & Dargie (1992) was soil type (mesotrophic vs. dystrophic); however, the floristic differentiation associated with this involves a suite of relatively few calcicolous species (Ratter *et al.*, 1977; Furley & Ratter, 1988) which can occur sporadically wherever erosion cuts down into base-rich rocks, and thus the distribution of this floristic subtype (mesotrophic facies cerradão) can be very scattered, although it sometimes covers large tracts, as in Mato Grosso do Sul. In addition to modern environmental factors, the present vegetation pattern of the cerrado biome must reflect major dynamic changes during the Tertiary and Quaternary periods, and much further research is necessary to correlate our observations with new data emerging on this subject.

Consideration of the total woody biodiversity of the cerrado biome is being reserved for a future publication but it is worth stressing one point here. Previous researchers (Rizzini, 1963, 1979; Castro & Martins, 1999) have considered that core areas of the cerrado are richest in species while the periphery shows a poorer flora containing accessory species characteristic of neighbouring biomes. However, our observations show that although much of the core (e.g. Federal District, etc.) is very rich in species, peripheral areas in the Rio Xingu, Araguaia and Tocantins drainage, and even in São Paulo state, show equally high, or sometimes higher, diversity. Furthermore, the diversity of their flora is of typical endemic, 'savannic', elements, not accessories shared with neighbouring biomes as has been suggested by some workers.

In conclusion, the data presented in this communication greatly amplify those of Ratter *et al.* (1996) and provide an enhanced picture of biogeographic patterns in the cerrado biome. They have already been used in identifying priority areas for conservation by the Global Environment Facility and Brazilian Government-financed project *Ações Prioritárias para a Conservação da Biodiversidade do Cerrado*

e Pantanal (see Cavalcanti, 1999). Many other results of the CMBBC project are to be published in the near future and it is hoped that they will influence the conservation of the cerrado biome as an important World Centre of Biodiversity.

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APPENDIX 1

The 617 species present at two or more sites and thus used in the analyses. The figures give the number of sites at which species occur. Species indicating richer (mesotrophic) soils are in bold. A, species occurring in the disjunct Amazonian savanna sites; W, widespread species recorded in cerrado area and disjunct Amazonian savanna sites; C, species found in core area but in this study recorded only in disjunct Amazonian sites; SP, recorded as a common species in São Paulo state surveys (Durigan, pers. comm. – see p. 78). When given, collectors' numbers are in parentheses.

Abuta grandifolia (Mart.) Sandw. 7
A. selloana (Benth.) Eichler 5
Acacia polyphylla DC. 5
A. paniculata Willd. 10
A. plumosa Lowe 2
Acosmium dasycarpum (Vogel) Yakovlev 200
A. nitens (Vogel) Yakovlev 4 **A**, **C**
A. subelegans (Mohl.) Yakovlev 64
***Acrocomia aculeata* (Jacq.) Lodd. ex Mart.** 53
Aegiphila integrifolia (Jacq.) Jacks. 2 **A**
A. lhotskiana Cham. 90
A. paraguariensis Briq. 5
A. sellowiana Cham. 3
A. tomentosa Cham. 2
A. verticillata Vell. 2
Agonandra brasiliensis Miers 129 **A**, **W**
Aiouea trinervis Meissn. 2
***Albizzia niopoides* (Spruce ex Benth.) Burk.** 3
Alchornea schomburgkii Klotzsch (incl. *A. discolor* Poepp. & Endl.) 12
A. triplinervia Müll. Arg. 4 **SP**

Alibertia concolor (Cham.) K. Schum. 8
A. edulis (L. Rich) A. Rich (incl. *A. lanceolata*) 115 **A**, **W**
A. elliptica (Cham.) K. Schum. 19
A. macrophylla K. Schum. 8
A. obtusa K. Schum. 64
A. sessilis (Vell.) K. Schum. 40
A. verrucosa S. Moore 8
Allophylus edulis Radlk. ex Warm. 5
***Aloysia virgata* Juss.** 2
Amaioua guianensis Aubl. 5 **SP**
Amburana cearensis (Fr. Allem.) A.C. Sm. 2
Anacardium occidentale L. 118 **A**, **W**
***Anadenanthera colubrina* (Vell.) Brenan var. *cebil* (Griseb.) Altschul** 39
A. peregrina (L.) Speg. 49 **A**, **W**
Andira cordata Arroyo ex R.T. Pennington 18
A. cuiabensis Benth. 90
A. inermis Kunth 5
A. vermifuga Mart. 148
Annona cacans Warm. 2
A. coriacea Mart. 173
A. crassiflora Mart. 148
A. dioica A. St.-Hil. 6
A. paludosa Aubl. 5 **A**
A. tomentosa R.E. Fr. 25
Annona sp. (R8012) 5
Annonaceae (R8202) 2
Antonia ovata Pohl 46 **A**, **W**
Apeiba tibourbou Aubl. 18 **A**, **W**
Apuleia leiocarpa (Vogel) J. Macbr. 9
Aspidosperma cylindrocarpum Müll. Arg. 5 **SP**
A. macrocarpon Mart. 123
A. multiflorum A. DC. 14
A. nobile Müll. Arg. 77
A. olivaceum Müll. Arg. 2
A. parvifolium A. DC. 9
***A. subincanum* Mart.** 70
A. tomentosum Mart. 165
Astrocaryum aculeatum G. Mey. 3
A. vulgare Mart. 3 **A**, **W**
***Astronium fraxinifolium* Schott** 178 **A**, **W**
***A. urundeuva* Fr. Allem.** 77
***Attalea phalerata* Mart.** 2
***A. speciosa* Mart. ex Spreng.** 4 **A**, **W**
Austroplenckia populnea (Reissek) Lundell 80
Baccharis dracunculifolia DC. 8
Banisteriopsis latifolia (A. Juss.) Cuatrec. 21
B. pubipetala (A. Juss.) Cuatrec. 5
Bauhinia brevipes Vogel (syn. *B. bongardii* Steud.) 14
***B. cupulata* Benth.** 7
B. forficata Link. 10
B. holophylla Steud. 6
B. mollis Walp. 2
B. pulchella Benth. 11
B. rufa (Bong.) Steud. 75
B. tenella Benth. 2
B. ungulata L. 12
Blepharocalyx salicifolius (Kunth) O. Berg (syn. *B. suaveolens* (Cambess.) Bur. & *B. acuminatus* O. Berg) 25
Bowdichia virgilioides Kunth 278 **A**, **W**
Bredemeyera altissima Klotzsch ex A.W. Benn. 4
B. floribunda Willd. 16
Brosimum gaudichaudii Trécul 195
Buchenavia tomentosa Eichler 81
Butia archeri (Glassman) Glassman (= *B. leiospatha* (Mart.) Becc.) 17
B. paraguayensis (Barb.-Rodr.) L.H. Bailey 4
Byrsonima basiloba A. Juss. 43
B. clausenniana A. Juss. 3
B. coccolobifolia Kunth 230 **A**, **W**
B. coriacea DC. 5 **SP**
B. correifolia A. Juss. 7
B. crassa Nied. (syn. *B. pachyphylla* A. Juss.) 195
B. crassifolia (L.) Kunth (syn. *B. fagifolia* Nied.) 84 **A**, **W**
B. cydoniifolia A. Juss. (syn. *B. orbignyana* A. Juss.) 11
B. dealbata Griseb. 2
B. guilleminiana A. Juss. 2
B. inodorum S. Moore 4
B. intermedia A. Juss. 62
B. lancifolia A. Juss. 3
B. cf. *oblongifolia* A. Juss. 2
B. psilandra Griseb. 2
B. schomburgkiana Benth. 4 **A**
B. sericea DC. 15
B. sessilifolia Benth. 3
B. stipulacea A. Juss. 7
B. variabilis A. Juss. 2

B. verbascifolia Rich. ex A. Juss. 176 **A, W**
Byrsonima sp. (R7756V) 4

Cabralea canjerana (Vell.) Mart. 7
***Callisthene fasciculata* (Spreng.) Mart.** 74
C. major Mart. 33
C. minor Mart. 3
Callisthene sp. nov.? (R7228) 19
Calophyllum brasiliense Cambess. 6
Calycolpus goetheanus Berg 2 **A**
***Calycophyllum multiflorum* Griseb.** 5
Campomanesia adamantium (Cambess.) O. Berg (=*C. cambessediana* O. Berg) 5 **SP**
C. coerulescens O. Berg 4
C. cf. *xanthocarpa* O. Berg 2
C. pubescens O. Berg (syn. *C. corymbosa* Blume) 34
C. salviaefolia O. Berg 2
Caraipa densifolia Mart. 2
Cardiopetalum calophyllum Schltdl. 24
Cariniana domestica (Mart.) Miers (incl. *C. rubra* Gardner ex Miers) 7
Caryocar brasiliense Cambess. 198
C. cuneatum Wittm. 54
Casearia arborea Urb. 11
C. decandra Jacq. 4
C. gossypiosperma Briq. 3
C. grandiflora Cambess. 40 **A, W**
C. javitensis Kunth 4
***C. rupestris* Eichler** 10
C. sylvestris Sw. 218 **A, W**
Cecropia pachystachya Trécul 46 **A, W**
***Cedrella fissilis* Vell.** 2
***Ceiba speciosa* (A. St.-Hil.) Gibbs & Semir** 2
Celtis pubescens (Kunth) Spreng. 8
Cenostigma macrophyllum Tul. 19
***Cereus jamacaru* DC.** 3
Chaetocarpus echinocarpus (Baill.) Ducke 4
C. multijuga Rich. 2 **A**
Chamaecrista orbiculata (Benth.) Irwin & Barneby 8
Cheiloclinium cognatum (Miers) A.C. Sm. 3
Chiococca alba Hitchc. 4
Chomelia obtusa Cham. & Schltdl. 11
C. pohliana Müll. Arg. 8
C. ribesioides Benth. 20
Chrysophyllum arenarium Fr. Allem. 3
C. marginatum Radlk. 11
Clusia sellowii Schltdl. 3
***Cnidoscolus vitifolia* (L.) Pohl** 16
Coccoloba brasiliensis Nees & Mart. 3
C. mollis Casar. 30
Cochlospermum orinocense Steud. 2
C. vitifolium (Willd.) Spreng. 26
***Combretum duarteanum* Cambess.** 6
***C. leprosum* Mart.** 8
C. mellifluum Eichler
Connarus suberosus Planch. 237
Copaifera langsdorfii Desf. 147
C. malmei Harms 51
C. martii Hayne 57
C. oblongifolia Mart. ex Hayne 3
Cordia alliodora (Ruiz & Pav.) Oken 5
***C. glabrata* (Mart.) A. DC.** 28
C. insignis Cham. 7
C. sellowiana Cham. 8
C. superba Cham. 7
***C. trichotoma* (Vell.) Arrab.** 13
Couepia grandiflora (Mart.) Benth. 131
Couepia sp. (S1082) 2
Coussarea hydrangeaefolia (Benth.) Müll. Arg. 46
Coutarea hexandra (Jacq.) K. Schum. 2
Croton floribundus Spreng. 3 **SP**
Cupania vernalis Cambess. 11
Curatella americana L. 247 **A, W**
Cybianthus densiflorus Mart. 2
C. detergens Mart. 18
Cybistax antisyphilitica Mart. 96

Dalbergia cuiabensis Benth. 5
D. glandulosa Benth. 2
D. miscolobium Benth. (=*D. violacea* (Vogel) Malme) 142
Daphnopsis fasciculata (Meissn.) Nevling 7
Davilla elliptica A. St.-Hil. 186
D. grandiflora A. St.-Hil. & Tul. 2
Dictyoloma incanescens DC. 2
Didymopanax distractiflorum Harms 20 **A, W**
D. macrocarpum (Cham. & Schltdl.) Seem. 66
D. morototoni Decne & Planch. 6
D. vinosum (Cham. & Schltdl.) March. 37
Didymopanax sp. (R8142) 2
Didymopanax sp. (S1004) 2
Didymopanax sp. (S1092) 2

***Dilodendron bipinnatum* Radlk.** 67
Dimorphandra mollis Benth. (incl. *D. gardnerianum* Tul.) 238
Diospyros hispida DC. 184
D. sericea DC. 38
***Dipteryx alata* Vogel** 101
Diptychandra aurantiaca (Mart.) Tul. (syn. *D. glabra* Benth.) 31
Doliocarpus dentatus (Aubl.) Standl. 3
Duguetia furfuracea (A. St.-Hil.) Benth. & Hook. 90
D. lanceolata A. St.-Hil. 5
D. magraviana Mart. 3

Emmotum nitens (Benth.) Miers 141
***Enterolobium contortisiliquum* (Vell.) Morong** 13
E. gummiferum (Mart.) J. Macbr. 119
Eremanthus glomerulatus Less. 28
E. goyazensis (Gardn.) Sch. Bip. 11
E. graciellae MacLeish & Shumach. 3
E. incanus (Less.) Less. 2
E. mattogrossensis O. Kuntze 6
Eriotheca gracilipes (Schum.) A. Robyns 159
Eriotheca parvifolia (Mart. & Zucc.) A. Robyns 26
E. pubescens (Mart. & Zucc.) Schott. & Endl. 61
E. rondoniensis 3
Eriotheca sp. (R7863V) 2
***Erythrina mulungu* Mart.** 3
Erythroxylum ambiguum Peyr. 9
E. anguifugum Mart. 3
E. betulaceum Mart. 6
E. citrifolium A. St.-Hil. 2
E. cuneifolium Poepp. ex O.E. Schulz 10
E. daphnites Mart. 31
E. deciduum A. St.-Hil. 85
E. engleri O.E. Schulz 5
E. cf. *foetidum* T. Plowman 3 **A**
E. gonocladum (Mart.) Schulz 4
E. pelleterianum A. St.-Hil. 2 **SP**
E. pruinosum O.E. Schulz 5
E. suberosum A. St.-Hil. 215 **A, W**
E. subracemosum Turcz. 6 **A, W**
E. tortuosum Mart. 99
E. vacciniifolium Mart. 2
Erythroxylum sp. (R7870) 3
Eschweilera nana (O. Berg) Miers 31
Eugenia aurata O. Berg 33
E. biflora DC. 6
E. bimarginata DC. 19
E. chrysantha O. Berg 7
E. coarensis Greves 2 **A**
***E. dysenterica* DC.** 121
E. florida DC. 7
E. hyemalis Cambess. 5
E. klotzschiana O. Berg 3
E. livida O. Berg 6 **SP**
E. pluriflora Mart. 3 **SP**
E. punicifolia (Kunth) DC. (syn. *E. polyphylla* O. Berg) 15 **A, W**
E. uniflora L. 2
Euplassa inaequalis (Pohl) Engl. 25

Ferdinandusa elliptica Pohl 56
Ficus citrifolia P. Mill. 3
F. gomelleira Kunth & Bouché 2

Genipa americana L. 18 **A, W**
Gochnatia barrosii Cabrera 10
G. polymorpha DC. 4 **SP**
G. pulchra Cabrera 7
Gomidesia lindeniana O. Berg 5
Guadua sp. 2
Guapira graciliflora (Mart. ex J.A. Schmidt) Lundell 48
G. noxia (Netto) Lundell var. *noxia* 63
G. noxia (Netto) Lundell var. *psammophila* (Mart. ex J.A. Schmidt) ined. 39
G. opposita (Vell.) Reitz 7 **SP**
G. tomentosa (Casar.) Lundell 5
Guatteria sellowiana Schltdl. 5
***Guazuma ulmifolia* Lam.** 85
***Guettarda viburnoides* Cham. & Schltdl.** 82

Hancornia speciosa Gomez (incl. *H. pubescens* Nees & Mart.) 173 **A, W**
Heisteria citrifolia Engl. 3
H. ovata Benth. 31
***Helicteres brevispira* A. Juss. in A. St.-Hil.** 18
H. corylifolia Nees & Mart. 2
H. sacarolha A. St.-Hil. 5
Heteropterys byrsonimifolia A. Juss. 84
Hibiscus peruvianus R.E. Fr. 2 **A**
Himatanthus articulatus (Vahl) Woodson 26 **A, W**

H. bracteatus (A. DC.) Woodson 2
H. obovatus (Müll. Arg.) Woodson 193 **A, W**
H. tarapotensis (Schumann) Plumel ex Spreng. 2
Hirtella ciliata Mart. ex Zucc. 54 **A, W**
H. glandulosa Spreng. 62 **A, W**
H. gracilipes (Hook.f.) Prance 8
H. racemosa Lam. 2
Humiria balsamifera (Aubl.) A. St.-Hil. 5 **A, C**
Hymenaea courbaril L. var. *stilbocarpa* (Hayne) Lee & Lagn. 36
H. eriogyne Benth. 6
H. stigonocarpa Mart. ex Hayne 236
Hyptidendron canum (Pohl ex Benth.) Harley (=*Hyptis cana* Pohl ex Benth.) 28

Ilex affinis DC. 4
I. cerasifolia Reissek 5
I. concocarpa Reissek 6
Inga vera Willd. ssp. *affinis* (DC.) T.D. Pennington 2

Jacaranda brasiliana Pers. 46
J. caroba (Vell.) DC. 18 **A, W**
***J. cuspidifolia* Mart.** 35

Kielmeyera coriacea (Spreng.) Mart. 227
K. corymbosa Mart. 6
K. grandiflora (Wawra) N. Saddi 3
K. lathrophyton Saddi 40
K. rosea Mart. 6
K. rubriflora Cambess. 56
K. speciosa A. St.-Hil. 34
Kielmeyera sp. nov.? (R7954) 19

Lacistema aggregatum (Berg) Rusby 7 **A, W**
L. floribundum Miq. 2
L. hasslerianum Chodat 5 **SP**
Lafoensia pacari A. St.-Hil. (incl. *L. densiflora* Pohl) 238 **A, W**
L. replicata Pohl 2
Lamanonia ternata Vell. 3
Leandra involucrata Raddi 3
L. lacunosa Cogn. 6
Licania gardneri (Hook.f.) Fritsch 15
L. humilis Cham. & Schltdl. 50
L. octandra (Hoffm. ex Roem. & Schult.) O. Kuntze 2
L. sclerophylla Mart. ex Hook.f. 12
Lippia corymbosa Cham. 2
L. microphylla Cham. 7 **A**
Lithraea molleoides (Vell.) Engl. (syn. *L. aroerinha* March. ex Warm.) 23
***Luehea candicans* Mart.** 11
L. divaricata Mart. 15
***L. grandiflora* Mart.** (syn. *L. rufescens* A. St.-Hil., *L. speciosa* sensu K. Schum. non Willd.) 23
***L. paniculata* Mart.** 101
Luetzelburgia auriculata (Fr. Allem.) Ducke 3
L. praecox Harms 8
Lychnophora ericoides Mart. 3

Mabea fistulifera Mart. 17 **A, W**
Macairea radula DC. 8
Machaerium aculeatum Raddi 3
M. acutifolium Vogel 189
M. angustifolium Mart. ex Benth. 12
M. hirtum (Vell.) Stellfeld 3 **SP**
M. opacum Vogel 99
***M. scleroxylon* Tul.** 8
M. stipitatum Vogel 2
M. tortum 2
M. villosum Vogel 10
***Maclura tinctoria* (L.) Don ex Steud.** 4
***Magonia pubescens* A. St.-Hil.** 146
Manihot grandiflora Müll. Arg. 2
M. tripartita (Spreng.) Müll. Arg. 9
Maprounea guianensis Aubl. 66 **A, W**
Martiodendron mediterraneum (Mart. ex Benth.) Koeppen 3
Matayba elaeagnoides Radlk. 2 **SP**
M. guianensis Aubl. 101 **A, W**
Maytenus ilicifolia Mart. ex Reissek 3
M. robusta Reissek 2 **SP**
Mezilaurus crassiramea (Meissn.) Taub. 27
M. matogrossensis nom. inedit. 2
Miconia albicans (Sw.) Triana 151 **A, W**
M. alborufescens Naud. 2
M. argyrophylla DC. 2 **A**
M. burchellii Triana 9
M. fallax DC. 17
M. ferruginata DC. 34
M. holosericea Triana 3 **A, W**
M. langsdorffii Cogn. 4 **SP**
M. ligustroides (DC.) Naud. 16
M. macrothyrsa Benth. 9

M. nervosa (Sm.) Triana 2 **A**, **W**
M. pepericarpa DC. 2
M. pohliana Cogn. 20
M. rubiginosa (Bonpl.) DC. 28 **A**, **W**
M. sellowiana Naud. 10
M. stenostachya DC. 26
M. theaezans Cogn. 4
Miconia sp. (R8199) 2
Mimosa acutistipula (Mart.) Benth. 2
M. claussenii Benth. 16
M. laticifera Rizzini & Mattos f. 18
M. manidea Barneby 2
M. microcephala Humb. & Bonpl. ex Willd. 4 **A**
M. pteridifolia Benth. 5
M. sericantha Benth. 2
M. verrucosa Benth. 2
Mollia burchellii Sprague 5
Monnina martiana Klotzcsh ex A.W. Benn. 2
Mouriri elliptica Mart. 95
M. pusa Gardner 63
Myrcia albotomentosa Cambess. 26
M. bella Cambess. 2 **SP**
M. camapuanensis N.J.E. Silveira 5
M. canescens O. Berg 10
M. castrensis (O. Berg) Legr. 4
M. fallax (Rich.) DC. 3 **SP**
M. formosiana Cambess. 2
M. gardneriana O. Berg. 3
M. guajavifolia O. Berg 2
M. intermedia Kiaersk. 3
M. lanuginosa O. Berg 12
M. lasiantha DC. 9
M. lingua (O. Berg) Mattos & Legr. 22
M. multiflora DC. 8
M. mutabilis O. Berg 2
M. ochroides O. Berg 4
M. pallens DC. 12
M. pubipetala Miq. 3
M. cf. *regnelliana* O. Berg 3
M. rorida (O. Berg) Kiaersk. 21
M. rostrata DC. 26
M. rufipes DC. 3
M. schottiana O. Berg 7
M. sellowiana O. Berg 31
M. sphaerocarpa DC. 2
M. splendens (Sw.) DC. 21
M. superba O. Berg 2
M. tomentosa (Aubl.) DC. 49
M. uberavensis O. Berg 9
M. variabilis DC. 18
M. venulosa DC. 2 **SP**
M. sp. (R8159) 2
M. sp. (R8160) 2
M. sp. (S1070) 6
M. sp. (S2243) 2
M. sp. (Sueli 275) 3
M. sp. (R7874V) 2
M. sp. (R7890) 3
M. sp. (R7927V) 3
M. sp. (R7944) 2
Myrciaria floribunda (West ex Willd.) O. Berg 2
Myrtaceae sp. (R8107) 2
Myrtaceae sp. (S1126V) 3
Myrtaceae sp. (Sueli 276) 4

Nectandra cuspidata Nees & Mart. 2 **SP**
Neea spruceana Heimerl. 2
N. theifera Oerst. 116
Norantea adamantinum Cambess. 2
N. goyazensis Cambess. 2

Ocotea acutifolia (Nees) Mez 4
O. corymbosa (Meissn.) Mez 5 **SP**
O. minarum Mart. ex Nees 15
O. pomaderroides (Meissn.) Mez 3
O. pulchella Mart. 19
O. spixiana (Nees) Mez 6
O. suaveolens (Meissn.) Hassler 3
Ouratea castaneaefolia Engl. 51 **A**, **W**
O. cuspidata (A. St.-Hil.) Engl. 2
O. hexasperma (A. St.-Hil.) Benth. 176 **A**, **W**
O. spectabilis (Mart.) Engl. 81
Oxandra sessiliflora R.E. Fr. 2

Palicourea rigida Kunth 140 **A**, **W**
Parkia platycephala Benth. 34
Peltogyne confertiflora (Hayne) Benth. 22
Peltophorum dubium (Spreng.) Taub. 2
Pera glabrata (Schott.) Baill. 22
P. obovata Baill. 4 **SP**
Persea pyrifolia Nees & Mart. ex Nees 3 **SP**
Phoebe erythropus (Nees, Mart. & Spix) Mez 5
***Physocallyma scaberimmum* Pohl** 49 **A**, **W**

Piptadenia gonoacantha (Mart.) J. Macbr. 5
P. moniliformis Benth. 3
Piptocarpha rotundifolia (Less.) Baker 125
Plathymenia reticulata Benth. 173 **A**, **W**
Platonia insignis Mart. 9 **A**, **W**
***Platymiscium floribundum* Vogel** 3
***Platypodium elegans* Vogel** (syn. *P. grandiflorum* Benth.) 44
Pouteria ramiflora (Mart.) Radlk. 210
P. torta (Mart.) Radlk. 91
***Priogymnanthus hasslerianus* (Chodat) P.S. Green** (syn. *Linociera hassleriana* (Chod.) Hassler) 14
Protium brasiliense (Spreng.) Benth. 4
P. heptaphyllum (Aubl.) Marchal 100 **A**, **W**
P. ovatum Engl. 18
Prunus brasiliensis (Cham. & Schltdl.) Schott. ex Spreng. 2
P. myrtifolia (L.) Urb. 3
P. sellowii Koehne 3
Pseudobombax grandiflorum (Cav.) A. Robyns 2
P. longiflorum (Mart. & Zucc.) A. Robyns 149
P. marginatum (A. St.-Hil., A. Juss. & Cambess.) A. Robyns 19
***P. tomentosum* (Mart. & Zucc.) A. Robyns** 74
Psidium aerugineum O. Berg 3
P. araça Raddi 3 **A**, **W**
P. australe Cambess. 4
P. cinereum Mart. ex DC. 3
P. guineense Sw. 28 **A**, **W**
P. myrsinoides O. Berg 76
P. pohlianum O. Berg 13
P. warmingianum Kiaersk. 21
Psychotria sessilis (Vell.) Müll. Arg. 3
Pterodon polygalaeflorus Benth. 68
P. pubescens Benth. 92
Pterogyne nitens Tul. 2

Qualea cordata Spreng. 10
Q. densiflora Warm. 2
Q. dichotoma (Mart.) Warm. 26
Q. glauca Mart. 2
Q. grandiflora Mart. 274
Q. multiflora Mart. 164
Q. parviflora Mart. 251

Randia armata (Sw.) DC. 3 **A**, **W**
R. formosa (Jacq.) K. Schum. 4 **A**, **C**
Rapanea ferruginea (Ruiz & Pav.) Mez 13
R. guianensis Kuntze 65
R. lancifolia (Mart.) Mez 6
R. leuconeura (Mart.) Mez 2
R. umbellata (Mart. ex DC.) Mez 20
Remijia amazonica K. Schum. 2 **A**, **W**
***Rhamnidium elaeocarpum* Reissek** 58
Richeria grandis Vahl 2
Rollinia emarginata Schltdl. 3
Roupala montana Aubl. 216 **A**, **W**
Rourea induta Planch. 126
Rudgea amazonica Müll. Arg. 3
R. viburnoides (Cham.) Benth. 68

Sacoglottis guianensis Benth. 2
Salacia crassifolia (Mart.) Peyr. 108
S. elliptica (Mart.) G. Don 22
Salvertia convallariodora A. St.-Hil. 189 **A**, **W**
Sapium longifolium (Müll. Arg.) Huber 10
S. marginatum Müll. Arg. 7
Sapium sp. (S1090) 2
***Schinopsis brasiliensis* Engl.** 2
Schinus terebinthifolius Raddi 19
Sclerolobium aureum (Tul.) Benth. 178
S. paniculatum Vogel 159 **A**, **W**
Sebastiana brasiliensis Spreng. 3
Senna bicapularis (Benth.) Irwin & Barneby 4
S. macranthera (DC. ex Colladon) Irwin & Barneby 3
S. obtusifolia (L.) Irwin & Barneby 4
S. rugosa (G. Don) Irwin & Barneby 18
S. silvestris (Vell.) Irwin & Barneby 14
S. uniflora (P. Mill.) Irwin & Barneby 2
S. velutina (Vogel) Irwin & Barneby 2
Simaba blanchettii Turcz. 3
Simarouba amara Aubl. 5 **A**, **W**
S. versicolor A. St.-Hil. 154 **A**, **W**
Siparuna guianensis Aubl. 73 **A**, **W**
Siphoneugena densiflora O. Berg 9
Solanum crinitum Lam. 7
S. lycocarpum A. St.-Hil. 47
Sorocea guilleminiana Gaud. 3
***Spondias mombin* L.** 4
***Sterculia striata* A. St.-Hil. & Naud.** 21
Strychnos pseudoquina A. St.-Hil. 137

Stryphnodendron adstringens (Mart.) Cov. 96
S. cf. *rotundifolium* Mart. ex Benth. 4
S. coriaceum Benth. 24
S. obovatum Benth. 110
S. polyphyllum Mart. 28
Styrax ambiguus Seub. 2
S. camporum Pohl 43
S. ferrugineus Nees & Mart. 94
S. nervosum A. DC. 2
Swartzia apetala Raddi 2
S. laurifolia Benth. 3 **A**
Syagrus comosa (Mart.) Mart. 82
S. flexuosa (Mart.) Becc. 68
S. oleracea (Mart.) Becc. 5
S. romanzoffiana (Cham.) Glassman 2 **SP**
Symplocos guianensis (Aubl.) Gurke 2 **A**
S. lanceolata (Mart.) A. DC. 4
S. nitens (Pohl) Benth. 5
S. pubescens Klotzsch ex Benth. 4 **SP**
S. rhamnifolia A. DC. 12
S. tenuifolia Brand. 3
S. uniflora (Pohl) Benth. 2

Tabebuia alba (Cham.) Sandw. 2
T. aurea (Manso) Benth. & Hook.f. ex S. Moore 218 **A, W**
***T. impetiginosa* (Mart. ex A. DC.) Standl.** 19
T. ochracea (Cham.) Standl. 214 **A, W**
T. roseoalba (Ridley) Sandw. 30
T. serratifolia (Vahl) Nich. 37
Tapirira guianensis Aubl. 107 **A, W**
Tapura amazonica Poepp. & Endl. 13
***Terminalia argentea* Mart. & Zucc.** 136
T. fagifolia Mart. & Zucc. 72
T. glabrescens Mart. 33
T. phaeocarpa Eichler 3
Ternstroemia brasiliensis Cambess. 3
Tetragastris balsamifera (Sw.) Oken 4
T. unifoliolata (Engl.) Cuatrec. 5 **A, W**
Tibouchina aspera Aubl. 7 **A**
T. candolleana Cogn. 5
T. sellowiana (Cham.) Cogn. 2
T. stenocarpa (DC.) Cogn. 2
Tocoyena brasiliensis Mart. 6 **SP**
T. bullata (Vell.) Mart. 3
T. formosa (Cham. & Schltdl.) K. Schum. 196 **A, W**
T. neglecta Brown 4 **A**
***Trema micrantha* Blume** 8
Trembleya parviflora (D. Don) Cogn. 4
Trichilia elegans A. Juss. 3
T. pallida Sw. 2
Triplaris americana L. 3

Unonopsis lindmannii R.E. Fr. 3
Unonopsis sp. (S2250) 3

Vanillosmopsis erythropappa (DC.) Sch.-Bip. 4
V. pohlii Baker 3
V. polycephala (DC.) Sch.-Bip. 7
Vatairea macrocarpa (Benth.) Ducke 190
Vellozia squamata Pohl 30
Vernonia diffusa Less. 2 **SP**
V. ferruginea Less. 90
V. rubiramea Mart. ex DC. 2
V. ruficoma Schltdl. ex Mart. 6
Virola sebifera Aubl. 57 **A, W**
Virola subsessilis Warb. 12
Vismia cayennensis (Jacq.) Pers. 5 **A, W**
V. glaziovii Ruhl. 14
V. guianensis (Aubl.) Choisy 4 **A, W**
***Vitex cymosa* Bert. ex Spreng.** 9
***V. polygama* Cham.** 17 **A, W**
V. regnelliana Mold. 2
V. schomburgkiana Schauer 5 **A**
Vochysia cinnamomea Pohl 39
V. elliptica Mart. 43
V. gardneri Warm. 31
V. haenkeana Mart. 22 **A, W**
V. pruinosa Pohl 2
V. rufa (C.K. Spreng.) Mart. 124
V. thyrsoidea Pohl 36
V. tucanorum (C.K. Spreng.) Mart. 41

***Ximenia americana* L.** 11
Xylopia amazonica R.E. Fr. 2 **A, W**
X. aromatica Lam. 185
X. brasiliensis Spreng. 6
X. nitida Dunal 2
X. sericea A. St.-Hil. 28
Xylosma benthamii Triana & Planch. 2

Zanthoxylum hasslerianum Chodat 2
Z. rhoifolium Lam. 49
***Z. riedelianum* Engl.** 32
Zeyheria montana Mart. 103

APPENDIX 2

The 334 species recorded at only one site. Those indicating richer (mesotrophic) soils are in bold. A, species occurring in the disjunct Amazonian savanna sites; C, species found in core area but in this study recorded only in disjunct Amazonian sites; SP, recorded as a common species in São Paulo state surveys (Durigan, pers. comm. – see p. 78).

Abarema cochliacarpos Gomes, Barneby & Grimes
Acacia glomerosa Benth.
Acacia lorentensis J. Macbr.
Acosmium lentiscifolium Schott.
Actinostemon conceptionis (Chodat & Hassler) Pax & K. Hoffm. **SP**
Aegiphila amazonica Mold. **A**
A. cf. *intermedia* Mold. **A**
Alibertia myrciifolia K. Schum.
Allophylus quercifolius (Mart.) Radlk.
Annona aurantiaca Barb. Rodr.
A. jahnii Saff. **A**
A. sp. (R7988)
Annonaceae sp. (R8222)
Aspidosperma camporum Müll. Arg.
A. polyneuron Müll. Arg.
A. populifolium A. DC.
A. pyricollum Müll. Arg.
A. warmingii Müll. Arg.
Attalea eichleri (Drude) Henderson
A. exigua Drude
A. maripa (Aubl.) Mart. **A**
Auxemma oncocalyx Taub.

Baccharis concinna G.M. Barroso
B. pseudotenuifolia Teodoro
Banisteriopsis malifolia (Nees & Mart.) B. Gates
B. variabilis B. Gates
Banisteriopsis sp. (S755)
Barbacenia ignea Mart.
Bauhinia burchellii Benth.
B. dubia G. Don var. *nitida* Benth.
B. longifolia (Bong.) Steud.
B. obtusata Vogel
Bocageopsis mattogrossensis (R.E. Fr.) R.E. Fr.
B. multiflora (Mart.) R.E. Fr.
Bocoa mollis (Benth.) Cowan
Bredemeyera brevifolia (Benth.) Kl. ex Benn.
Buchenavia tetraphylla (Aubl.) Howard (syn. *B. capitata* (Vahl) Eichler)
Byrsonima affinis W. Anderson
B. campestris L.
B. gardneriana A. Juss.
B. laxiflora Griseb.
B. leucophlebia Griseb.
B. ligustrina A. Juss.
B. ligustroides A. Juss.
B. linguifera Nied. **A**
B. vacciniaefolia A. Juss.

Caesalpinia bracteosa Tul.
Callisthene hassleri Briq.
C. microphylla Warm.
***Calotropis procera* Dryand**
Calyptranthes clusiaefolia (Miq.) O. Berg
C. concina DC. **SP**
C. lucida Mart. ex DC.
Campomanesia guazumaefolia (Cambess.) O. Berg
Cariniana estrellensis (Raddi) O. Kuntze
Casearia commersoniana Cambess.
C. lasiophylla Eichler **SP**
C. ulmifolia Vahl ex Vent. **A**
Cassia catingae Harms
Cecropia concolor Willd. **A**
C. cyrtostachya Miq.
Celtis sp. (R7548)
Centrolobium tomentosum Guill. ex Benth.
Cereus peruvianus (L.) Mill.
Chamaecrista eitenorum (Irwin & Barneby) Irwin & Barneby
C. cf. *peruana* Irwin & Barneby
C. speciosa Kunth
Chaunochiton kappleri Ducke
Chomelia parviflora Müll. Arg.
C. tenuiflora Benth. **A**
Chrysophyllum gonocarpum (Mart. & Eichler) Engler
Chrysophyllum sp. (S554)
Cinnamomum sellowianum (Nees & Mart.) Kosterm.
Clethra brasiliensis Cham. & Schltdl.
C. scabra Pers.

***Cnidoscolus urens* (L.) Arthur A, C**
Coccoloba cf. *uvifera* L.
C. paniculata Meissn.
***Commiphora leptophloeos* (Mart.) Gillet**
Connarus perottetii (DC.) Planch. var. *angustifolium* Radlk. **A, C**
Copaifera coriacea Mart.
C. marginata Benth.
Cordia bicolor DC. **A**
C. multispicata Cham. **A**
C. piauhiensis Fresen.
Croton urucurana Baill.
Cupania polyodonta
C. rubiginosa (Poir.) Radlk. **A**
***Cyclolobium brasiliense* Benth.**

Davilla kunthii A. St.-Hil.
Desmoncus orthacanthos Mart.
Diatenopteryx sorbifolia Radlk.
Diospyros coccolobaefolia Mart. ex Miq.
D. matogrossensis Hoehne
Duguetia cauliflora R.E. Fr.
D. glabriuscula R.E. Fr.

Ephedranthus parviflorus S. Moore
Eremanthus argenteus Mcleish & Schumach.
Erythrochiton brasiliense Nees & Mart.
Erythroxylum mucronatum Benth.
E. rufum Cav.
E. squamatum Sw.
Esenbeckia febrifuga A. Juss.
Eugenia albotomentosa Cambess.
E. brasiliana Legr.
E. cerasiflora Kurz
E. geminiflora O. Berg
E. inundata DC.
E. mugiensis O. Berg
E. myrcianthes Nied.
E. pitanga (O. Berg) Kiaersk.
E. pyriformis Cambess. **SP**
E. uruguayensis Cambess.
Eupatorium vautherianum DC.
Exellodendron gardneri (Hook.f.) Prance

Ficus doliaria Mart.
F. guaranitica Chodat
F. guianensis Desv.

Genipa caruto Kunth
Guapira obtusata (Jacq.) Lundell
G. paniculata
Guatteria australis A. St.-Hil.
G. coriacea R.E. Fr.
G. nigrescens Mart.
G. silvatica R.E. Fr.
G. subsessilis Mart.
G. villosa A. St.-Hil.
Guatteria sp. (R8086V)
Guettarda spruceana Müll. Arg.

Helicteres guazumifolia Kunth
***H. lhotskyana* (Schott. & Endl.) K. Schum.**
Helietta apiculata Benth. **SP**
Heteropterys acutifolia A. Juss.
H. anoptera A. Juss.
H. cf. *escaloniifolia* A. Juss.
H. cf. *procoriacea* Nied.
Himatanthus sucuuba (Spruce) Woodson
Hirtella angustifolia Schott.
Hymenaea maranhensis Lee & Langenheim
H. parvifolia Huber

Ilex paraguariensis A. St.-Hil.
I. theezans Mart. ex Reissek
Inga alba Willd.
I. fagifolia (L.) Willd.
I. marginata Willd.
I. striata Benth.

Jacaranda jasminoides (Thunb.) Sandw.
J. micrantha Cham.

Kielmeyera petiolaris Mart.
K. rugosa Choisy

Lacistema serrulatum Mart.
Lafoensia punicaefolia DC.
L. vandelliana Cham. & Schltdl.
Laplacea fruticosa (Schrader) Kobuski
Leandra solenifera Cogn.
Licania apetala (E. Mey.) Fritsch **A, C**
L. blackii Prance
L. dealbata Hook.f.
L. minutiflora (Sagot) Fritsch
L. rigida Benth.
Licania sp. (R7601V)
Lonchocarpus araripensis Benth.

Lonchocarpus sp. (R7759)
Ludwigia nervosa (Poir.) Hara

Maba inconstans (Jacq.) Griseb.
Mabea nitida Benth.
M. pohliana Müll. Arg.
M. riedelii Müll. Arg.
Machaerium brasiliense Vogel **SP**
M. lanatum Tul.
Manihot coerulescens Pohl
Matayba inelegans (Spruce) Radlk.
Maytenus alaternoides Reissek
M. communis Reissek
M. evonymoides Reissek
Maytenus sp. (R7833)
Melochia hirsuta Cav. **A**
Miconia argentea DC.
M. chamissois Naud.
M. chartacea Triana
M. cuspidata Naud.
M. flavescens Cogn. ex Britton
M. ibaguensis (Bonpl.) Triana
M. irwinii Wurdack
M. minutiflora (Bonpl.) DC.
M. paniculata Naud.
M. pyrifolia Naud.
M. thyrsoidea Benth.
M. tiliaefolia Naud. **A**
Micropholis gardneriana (A. DC.) Pierre
Mimosa adenocarpa Benth.
M. adenophylla Taub.
M. exalbenses Barneby
M. hebecarpa Benth.
M. imbricata Benth.
Moutabea excoriata Mart. ex Benn.
M. guianensis Aubl.
Myrcia amethystina (O. Berg) Kiaersk.
M. arborescens O. Berg
M. breviramis (O. Berg) Legr.
M. cuprea (O. Berg) Kiaersk. **A**
M. deflexa (Poir.) DC.
M. guianensis (Aubl.) DC.
M. cf. *lasiopus* DC.
M. longipes (O. Berg) Kiaersk.
M. nigropunctata (O. Berg) N. Silveira
M. obtecta (O. Berg) Kiaersk.
M. prunifola DC.
M. rhodosepala Kiaersk.
M. vestita DC.
Myrciaria ciliolata Cambess. **SP**

Nectandra lanceolata Nees
Neea macrophylla Poepp. & Endl.
N. mollis Spruce ex K. Schum.
Neea sp. (R7580)

Ocotea pretiosa Benth. & Hook.f.
O. velloziana (Meissn.) Mez **SP**
O. velutina Mart. **SP**
Ormosia arborea (Vell.) Harms.
O. smithiana O.C. Schmidt **A**
Ouratea ferruginea Engl.
O. floribunda Engl.
O. pygmaea (Tiegh.) K. Yam.
O. schomburgkii (Planch.) Engl. **A**

Pallasia stanleyana Klotzsch **A**
Parkia pendula (Willd.) Benth. ex Walp.
Peltogyne campestris L. **A**
Persea alba Nees
P. venosa Nees & Mart. ex Nees
Phyllocarpus riedelii Tul.
Piper aduncum L.
Piptocarpha axillaris (Less.) Baker
P. macropoda (DC.) Baker
P. regnellii (Schultz) Cabrera
P. tomentosa Baker
Pisonia ambigua Heimerl.
Pithecellobium moniliforme Ducke
P. parvifolium (Willd.) Benth.
Platycyamus regnellii Benth.
Plumeria velutina Müll. Arg.
Prockia crucis L.
Protium grandifolium Engl.
P. paniculatum Engl.
Pseudolmedia laevigata Trécul
Psidium acutangulum DC.
P. incanescens Mart. ex DC.
P. sartorianum (O. Berg) Nied.
P. widgrenianum O. Berg
Psidium sp. (S1074)
Psychotria involucrata Sw.

Randia densiflora Benth. **A**
R. hebecarpa Benth. **A**
Rapanea brasiliensis
R. intermedia Mez
R. oblonga Pohl ex Miq.
R. paniculata Naud.
Remijia ferruginea (A. St.-Hil.) DC.

Rhamnus sphaerosperma Sw. var. *pubescens* (Reissek) M.C. Johnston
Rollinia cf. *mucosa* (Jacq.) Baill.
R. silvatica (A. St-Hil.) Mart.
Rudgea burchelliana Müll. Arg.
R. crassiloba (Benth.) B.L. Robinson
R. jacobinensis Müll. Arg.
R. krukovii Standl.
R. obtusa Standl.
R. villosa Benth.
Rynchanthera grandiflora (Aubl.) DC. **A**

Sapium glandulatum (Vell.) Pax
***S. glandulosum* (L.) Morong**
S. obovatum Klotzsch ex Müll. Arg.
Schinus longifolius (Lindl.) Speg. var. *paraguariensis* (Hassler) Barkl.
Schoepfia lucida Pulle
Senna alata (L.) Roxb.
S. cana (Nees & Mart.) Irwin & Barneby
S. chrysocarpa (Desv.) Irwin & Barneby
S. latifolia (G. Mey.) Irwin & Barneby
S. obovata Link
S. ovalifolia Batka
S. pendula (Willd.) Irwin & Barneby
S. quinquangulata (L.C. Rich) Irwin & Barneby
S. spectabilis (DC.) Irwin & Barneby var. *excelsa* (Schroder) Irwin & Barneby
S. splendida (Vogel) Irwin & Barneby
Simaba ferruginea A. St.-Hil.
S. glabra Engl.
S. trichilioides A. St.-Hil.
Simira hexandra (S. Moore) Steyerm.
S. rubescens (Benth.) Bremek. ex Steyerm.
Siphoneugena widgreniana O. Berg
Sloanea monosperma Vell.
Solanum cordifolium Dun.
S. grandiflorum Ruiz & Pav.
S. jamaicense Mill. **A**
S. subinerme Jacq. **A**
Stryphnodendron microstachyum Endl.
Stylogyne warmingii Mez
Styrax martii Seub.
S. pallidus A. DC.
Swartzia grandifolia Bong. ex Benth. **A**
S. racemosa Benth. **A**
Swartzia sp. nov. (R7762)
Syagrus coronata (Mart.) Becc.
Symplocos celastrinea Mart. ex Miq.
S. frondosa Brand.
S. mosenii Brand.

Tabebuia heptaphylla (Vell.) Toledo
T. insignis (Miq.) Sandw.
Tabernaemontana hystrix Steud.
Talisia subalbens Radlk.
Tapirira marchandii Engl.
Thiloa glaucocarpa (Mart.) Eichler
Tibouchina clidemioides (Berg ex Triana) Cogn.
T. fothergillae Cogn.
Tococa formicaria Mart.
Tontelea micrantha (Mart.) A.C. Sm.
Trattinickia rhoifolia Willd.
***Trichilia catigua* A. Juss.**
Trigonia villosa Aubl. **A**

Vanillosmopsis arborea (Gardn.) Baker
Vatairea sericea Ducke
Vernonia brasiliana (L.) Druce **A**
V. cinerea Less.
V. cognata Less.
V. polyanthes Less.
V. venosissima Sch.-Bip. ex Baker
Vitex montevidensis Cham.
***V. panshiniana* Mold.**

Wunderlichia crulsiana Taub.
W. mirabilis Riedel ex Baker

Zanthoxylum caribaeum Lam.
Z. gardneri Engl.
Z. hiemale A. St.-Hil.
Zeyheria tuberculosa (Vell.) Bureau ex Verlot **SP**
Zollernia ilicifolia Vogel
Z. paraensis Huber

ANALYSIS OF THE FLORISTIC COMPOSITION OF THE BRAZILIAN CERRADO VEGETATION II: COMPARISON OF THE WOODY VEGETATION OF 98 AREAS

J. A. RATTER*, S. BRIDGEWATER*, R. ATKINSON*† & J. F. RIBEIRO‡

An analysis was made of the floristic composition of 98 areas of cerrado and Amazonian savanna, encompassing most of the area of such vegetation in Brazil. A total of 534 species of trees and large shrubs were recorded for these areas, of which 158 (30%) occurred at a single site only. Such unicates and taxa without determinations to specific level were excluded from the study since they provide no basis for comparison. The data were analysed by three techniques of multivariate analysis: (a) a divisive hierarchical classification by Two-way Indicator Species Analysis (TWINSPAN), (b) an agglomerative hierarchical classification by UPGMA (Unweighted Pair-Groups Method using Arithmetic Averages) using the Sørensen Coefficient of Community (CC) as a measure of similarity, and (c) an ordination by Detrended Correspondence Analysis (DCA). The results from all three methods showed great similarity, demonstrating a strong geographic pattern in the distribution of the flora of the cerrado biome and allowing the recognition of southern (São Paulo and S Minas Gerais), southeastern (largely Minas Gerais), central (Federal District, Goiás and parts of Minas Gerais), central-western (largely Mato Grosso, Goiás and Mato Grosso do Sul) and northern groups (principally Maranhão, Tocantins and Pará), as well as a disjunct group of Amazonian savannas. Soil type (mesotrophic or dystrophic) is an important factor in determining floristic composition. The study demonstrated that cerrado vegetation is extremely heterogeneous: none of the 534 species occurred at all sites and only 28 species were present at 50% or more.

Keywords. Amazonian savanna, cerrado, multivariate analysis, patterns of biodiversity.

Uma análise foi feita da composição florística de 98 áreas de cerrado e savana amazônica, englobando a maior parte da área desta vegetação no Brasil. Registrou-se um total de 534 espécies de árvores e arbustos grandes, com 158 espècies (30%) ocorrendo apenas em um local. Tais unicatas e taxa sem determinações até o nível de espécie foram eliminadas das análises por não oferecem uma base para comparação. Os dados foram analisados por três técnicas de análise multivariada: (a) uma classificação hierárquica divisiva por 'Two-Way Indicator Species Analysis' (TWINSPAN), (b) uma classificação hierárquica aglomerativa por UPGMA (Unweighted Pair-Groups Method using Arithmetic Averages) usando o Coeficiente de Comunidade de Sørensen como uma medida de semelhança, e (c) uma ordenação por

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Detrended Correspondence Analysis (DCA). Os resultados de todos os três métodos apresentaram grande semelhança, indicando um padrão geográfico bem forte na distribuição da flora do bioma Cerrado. Foi possível reconhecer grupos do sul (São Paulo e S Minas Gerais), sudeste (principalmente Minas Gerais), centro (Distrito Federal, Goiás e regiões de Minas Gerais), centro-oeste (na maioria Mato Grosso, Goiás e Mato Grosso do Sul) e norte (principalmente Maranhão, Tocantins e Pará), e ainda um grupo das savanas amazônicas separadas. O tipo de solo (distrófico ou mesotrófico) é um fator importante na composição florística. O estudo indicou mais uma vez que a vegetação do cerrado é extremamente heterogênea: nenhuma das 534 espécies ocorreu em todos os sítios e só 28 espécies ocorreram em 50% ou mais das áreas.

Palavras-chave. Análise multivariada, cerrado, padrões de biodiversidade, savana amazônica.

INTRODUCTION

In 1992 we reported a comparison of the woody species of 26 areas of cerrado, representing all the survey records available to us in 1986–87 (Ratter & Dargie, 1992). The present work is an extension of that study but is now able to compare 98 areas, demonstrating the great increase in interest and research in the cerrado biome during the last eight years.

The stimulus for more intensive research comes from the realization that the cerrado biome is a unique and extremely rich centre of biodiversity (estimated as having 160,000 species of plants, animals and fungi by Dias, 1992) and is highly endangered by agricultural development. As a result of this, many studies are being undertaken of which two interlinked initiatives should be mentioned, the 'Biogeography of the Cerrados' and the 'Biodiversity of the Cerrados' projects. The former is centred at the Forestry Department of the University of Brasília (UnB) and is led by Dr Jeanine Felfili, while the latter is a collaboration between UnB and the Brazilian government cerrado research station CPAC/EMBRAPA and is led by Dr J.F. Ribeiro. Much of the data compared in the present work comes from the surveys of these two projects and targets areas for which there was little or no previous information. Similar cerrado survey work is being carried out in the north-east of Brazil by Dr Alberto Jorge F. Castro of the Federal University of Piauí who is also working on general cerrado biogeography and has recently written a thesis on these subjects (Castro, 1994a, b). Readers are referred to Ratter & Dargie (1992) for a brief background to this study.

MATERIALS AND METHODS

Floristic and environmental data

Literature was searched for floristic lists which were added to those of the 26 areas analysed by Ratter & Dargie (1992). The majority came from works confined to cerrado vegetation, but some included other vegetation types (principally gallery

forest) and the habitats of species were not always indicated. In such cases only species of known cerrado occurrence were selected. Many other records came from the 1993–94 fieldwork of the Biodiversity and Biogeography of the Cerrados projects in Maranhão, Tocantins, Pará, Goiás and Amapá. Unfortunately, as in our previous study (Ratter & Dargie, 1992), the sites compared vary greatly in size and sample methodology, but in the main floristic lists for very large areas were not included. The sites range in richness of woody species from those of the cerrado core area with more than 100 species (reaching 188 in the Chapada dos Guimarães) to Amazonian savannas with only seven species. In total, data were assembled from 98 sites, covering most of the cerrado domain and including some Amazonian cerrados. The localities are listed in Table 1 and shown on the map (Fig. 1).

Only species of tree or large shrub habit were entered in the comparisons. Small and slender shrubs with woody shoots of short duration produced from a long-lived rootstock (geoxyles or hemixyles), an important growth form in the cerrado, were

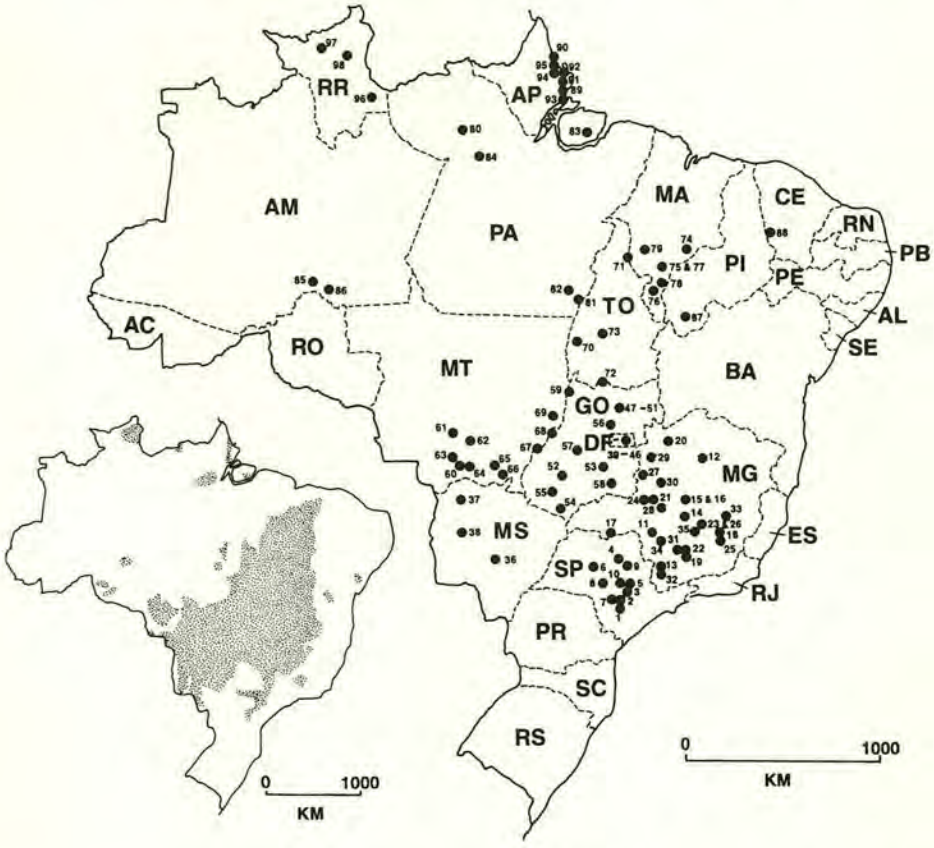

FIG. 1. Map showing sites compared in the study. See Table 1 for reference to the numbers. The inset map shows the approximate distribution of cerrado and Amazonian savanna in Brazil.

TABLE 1. Areas of cerrado (and Amazonian savanna) compared in the study. Figures in parentheses are the numbers of species recorded at only a single site; Meso. spp. = no. of indicator species of mesotrophic soils; Meso. index = no. of mesotrophic indicator species/total no. of species. Biodiv. = Biodiversity of the Cerrados project; Biogeog. = Biogeography of the Cerrados project. Asterisks indicate sites not entered in the ordination (DCA) analysis.

No.	Code	Locality	Co-ord.	No. of spp.	Meso. spp.	Meso. index	Ref.
1	SPA	Angatuba, SP	23°28′S 48°28′W	70 (5)	1	0.01	Ratter et al. (1988a)
2	SPB	Botucatu, SP	22°45′S 48°25′W	53 (2)	1	0.02	Silberbauer-Gottsberger & Eiten (1983)
3	SPC	Faz. Campininha, SP	22°15′S 47°10′W	103 (3)	3	0.03	Gibbs et al. (1983), Eiten (1963)
4	SPD	Itirapina, SP	22°08′S 47°47′W	42	0	0	Durigan et al. (1994)
5	SPE	Emas, SP	22°02′S 47°30′W	33	0	0	Ferri & Coutinho (1958)
6	SPF	Corumbataí, SP	22°15′S 47°00′W	92 (12)	3	0.03	Cesar et al. (1988)
7	SPI	Brotas-Itirapina, SP	22°15′S 47°49′W	38	0	0	Souza (1977)
8	SPL	Luis Antonio Expt. Stn, SP	21°40′S 47°49′W	62	1	0.02	Toledo-Filho (1984)
9	SPM	Mojí-Mirim, SP	22°26′S 46°57′W	90 (12)	3	0.03	Toledo-Filho et al. (1989)
10	SPV	Vaçununga, SP	21°41′S 47°37′W	70	0	0	Castro (1987)
11	MGA	Araxá, MG	19°46′S 46°55′W	39	0	0	Brandão & Gavilanes (1992)
12	MGB	Montes Claros, MG	16°45′S 43°52′W	76	9	0.12	Brandão & Gavilanes (1992)
13	MGC	Lagoa Santa, MG	19°39′S 43°44′W	110 (7)	9	0.08	Warming (1892), Brandão & Gavilanes (1992)
14	MGD	Curvelo, MG	18°45′S 44°27′W	59	6	0.1	Brandão & Gavilanes (1992), Rizzini (1975)
15	MGE	Corinto, MG	18°22′S 44°27′W	54	5	0.09	Brandão & Gavilanes (1992)
16	MGF	Felixlândia, MG	18°45′S 44°52′W	55	5	0.09	Brandão & Gavilanes (1992)
17	MGG	Triângulo Mineiro, MG	19°29′S 48°50′W	116 (13)	9	0.03	Goodland (1970)
18	MGH	Prudente de Morais, MG	19°36′S 44°04′W	58	4	0.07	Brandão & Gavilanes (1992)
19	MGI	Itumirim, MG	21°18′S 44°48′W	47	2	0.04	Brandão & Gavilanes (1992)
20	MGJ	Januária, MG	15°20′S 44°23′W	38 (1)	8	0.21	Ratter et al. (1977)
21	MGK	Patos de Minas, MG	18°34′S 46°31′W	33	1	0.03	Brandão & Gavilanes (1992)

22	MGL	Lavras, MG	21°14′S 44°59′W	69 (1)	5	0.07	Brandão & Gavilanes (1992)
23	MGM	Paraopeba, MG	19°20′S 44°20′W	60 (1)	7	0.11	Silva Junior (1984)
24	MGN	Coromandel, MG	18°20′S 47°12′W	43	1	0.02	Brandão & Gavilanes (1992)
25	MGO	Sete Lagoas, MG	19°32′S 44°06′W	69	4	0.06	Brandão & Gavilanes (1992)
26	MGP	Paraopeba, MG	19°18′S 44°25′W	60	5	0.08	Brandão & Gavilanes (1992)
27	MGQ	Paracatú, MG	17°00′S 46°45′W	53	1	0.02	Felfili & Silva Junior (1993)
28	MGR	Patrocínio, MG	18°47′S 46°25′W	57	1	0.02	Felfili & Silva Junior (1993)
29	MGS	Sagarana, MG	16°00′S 47°00′W	48	14	0.27	Ratter et al. (unpubl.)
30	MGT	Trés Marias, MG	18°12′S 45°10′W	55	6	0.11	Brandão & Gavilanes (1992)
31	MGU	Uberaba, MG	19°47′S 47°57′W	35	0	0	Brandão & Gavilanes (1992)
32	MGV	Campo do Meio, MG	21°06′S 45°50′W	56	1	0.02	Carvalho (1987)
33	MGW	Alpinópolis, MG	20°55′S 46°15′W	46	0	0	Carvalho (1987)
34	MGX	Pimenta, MG	20°30′S 45°50′W	73	4	0.05	Carvalho (1987)
35	MGY	Pedro Leopoldo, MG	19°39′S 44°03′W	28	2	0.07	Rizzini (1975)
36	MSF	Campo Grande, MS	20°24′S 54°35′W	25	2	0.08	Ferri & Coutinho (1958)
37	MSP	Fazenda Acurizal, MS	17°45′S 57°37′W	57 (11)	18	0.3	Prance & Schaller (1982)
38	MSR	Fazenda Nhumirim, MS	18°59′S 56°39′W	88 (2)	17	0.19	Pott et al. (1986)
39	DFB	São Bartolomeu, DF	15°50′S 47°30′W	137	6	0.04	Pereira et al. (1985)
40	DFE	E. E. das Aguas Emendadas, DF	15°31′S 47°32′W	65	1	0.01	Felfili & Silva Junior (1993)
41	DFF	Fazenda Agua Limpa, DF	15°45′S 47°57′W	130	4	0.03	Ratter (1986)
42	DFG	APA Gama. da Cab. Vead., DF	15°52′S 47°50′W	59	1	0.02	Felfili & Silva Junior (1993)
43	DFI	Res. Ecol. do IBGE, DF	15°55′S 47°53′W	114 (1)	6	0.05	Pereira et al. (1993)
44	DFJ	Jardim Botânico, Brasília, DF	15°48′S 47°50′W	79	5	0.06	Fundação Zoobotânica (1990)
45	DFN	Brasília National Park, DF	15°37′S 47°54′W	52	0	0	Felfili & Silva Junior (1993)
46	DFP	Planaltina, DF	15°39′S 47°38′W	111 (1)	1	0.01	Ribeiro et al. (1985)
47	GOA	Chapada dos Veadeiros, GO	14°07′S 47°31′W	54	1	0.02	Biodiv. & Biogeog. (unpubl.)
48	GON	Chapada dos Veadeiros, GO	14°07′S 47°13′W	59	15	0.25	Biodiv. & Biogeog. (unpubl.)

TABLE 1. (*cont.*)

No.	Code	Locality	Co-ord.	No. of spp.	Meso. spp.	Meso. index	Ref.
49	GOR	Chapada dos Veadeiros, GO	14°07′S 47°16′W	89	27	0.3	Biodiv. & Biogeog. (unpubl.)
50	GOT	Chapada dos Veadeiros, GO	13°55′S 47°23′W	62 (18)	0	0	Biodiv. & Biogeog. (unpubl.)
51	GOV	Chapada dos Veadeiros, GO	14°02′S 47°26′W	51	0	0	Biodiv. & Biogeog. (unpubl.)
52	GOC	Caiapônia, GO	16°57′S 51°49′W	125 (2)	22	0.17	Biodiv. & Biogeog. (unpubl.)
53	GOG	Goiânia, GO	16°43′S 49°18′W	29	0	0	Ferri & Coutinho (1958), Rizzo et al. (1972)
54	GOJ	Jataí, GO	17°58′S 51°45′W	61	6	0.1	Biodiv. (unpubl.)
55	GOM	Caiapônia & Mineiros, GO	17°22′S 52°10′W	58	15	0.26	Biodiv. (unpubl.)
56	GOP	Padre Bernardo, GO	15°15′S 48°30′W	83 (2)	15	0.18	Ratter et al. (1977)
57	GOS	Serra Dourada, GO	16°22′S 50°20′W	40	0	0	Rizzo (1970)
58	GOW	Silvânia, GO	16°30′S 48°30′W	64	2	0.03	Felfili & Silva Junior (1993)
59	MTB	Base Camp, MT	12°49′S 51°46′W	129 (12)	19	0.14	Ratter et al. (1973)
60	MTC	Chapada das Guimarães, MT	15°21′S 55°49′W	188 (12)	19	0.1	Oliveira-Filho (1984)
61	MTG	Mun. de Cuiabá, MT	15°32′S 56°05′W	23	4	0.17	Guarim Neto et al. (1994)
62	MTN	Cuiabá, MT	15°36′S 56°06′W	37	3	0.08	Nascimento & Saddi (1992)
63	MTO	Baixada Cuiabana, MT	15°30′S 56°02′W	111	21	0.18	Oliveira-Filho & Martins (1991)
64	MTP	Poconé, MT	16°16′S 56°37′W	34 (1)	18	0.51	Ratter et al. (1988b)
65	MTR	Rondonôpolis, MT	16°29′S 54°37′W	94	15	0.16	Biodiv. (unpubl.)
66	MTS	Serra da Petrovina, MT	16°47′S 54°06′W	94	20	0.21	Biodiv. (unpubl.)
67	MTT	Torixoreu,MT	15°53′S 52°23′W	53 (1)	18	0.33	Furley et al. (1988)
68	MTV	Vale de Sonhos, MT	15°00′S 52°13′W	72	12	0.16	Ratter et al. (1977)
69	MTX	Nova Xavantina, MT	14°45′S 52°20′W	121 (1)	14	0.11	Ratter et al. (1973)
70	TOA	Ilha do Bananal, TO	10°26′S 50°25′W	106 (7)	13	0.12	Ratter (1987)
71	TOB	Fazenda Bragança, TO	06°53′S 47°48′W	34	2	0.06	Biodiv. (unpubl.)

72	TOF	10km S of Figueirópolis, TO	12°04′S 49°10′W	76 (1)	13	0.17	Biodiv. (unpubl.)
73	TOH	Fazenda Belo Horizonte, TO	10°05′S 48°55′W	60	9	0.15	Biodiv. (unpubl.)
74	MAB	Rio Balsinha, MA	07°30′S 46°05′W	43	1	0.02	Biodiv. (unpubl.)
75	MAC	Carolina, MA	07°07′S 47°25′W	63	2	0.03	Biodiv. (unpubl.)
76	MAF	Fazenda Parnaiba, MA	07°30′S 46°05′W	60	11	0.18	Biodiv. (unpubl.)
77	MAM	Carolina, MA	07°07′S 47°25′W	21	9	0.41	Biodiv. (unpubl.)
78	MAP	Pé de Galinha, MA	07°45′S 45°50′W	62	10	0.16	Biodiv. (unpubl.)
79	MAQ	Pedra Caída, MA	06°57′S 47°28′W	62 (1)	1	0.02	Biodiv. (unpubl.)
80	PAA*	Ariramba, PA	01°10′S 55°35′W	24	0	0	Egler (1960)
81	PAC	Fazenda Chocolate, PA	08°21′S 50°00′W	64 (1)	9	0.14	Biodiv. (unpubl.)
82	PAG	Fazenda de Prof. Getulinho, PA	08°21′S 50°06′W	66	8	0.12	Biodiv. (unpubl.)
83	PAM*	Marajó, PA	00°45′S 48°30′W	20	1	0.05	Bastos (1984)
84	PAS	Alter do Chão, PA	02°36′S 54°56′W	49 (1)	2	0.04	Sanaiotti (1991), Branch & Silva (1983), Miranda (1993)
85	AMG*	Humaitá, AM	07°31′S 63°00′W	17	0	0	Gottsberger & Morawetz (1986)
86	AMH	Humaitá, AM	07°40′S 63°00′W	46 (9)	1	0.02	Janssen (1980)
87	PIC	Uruçuí-Una, PI	08°50′S 44°10′W	37 (1)	2	0.05	Castro (1986)
88	CES*	Sertão de Salgado, CE	06°38′S 39°30′W	20	2	0.1	Figueiredo (1987)
89	APA*	APA de Curiaú, AP	00°20′N 51°03′W	17	0	0	Sanaiotti et al. (1996)
90	APC*	5km S of Calçoene, AP	02°27′N 50°33′W	6 (1)	0	0	Sanaiotti et al. (1996)
91	APE*	EMBRAPA Stn., AP	00°37′N 51°05′W	19	1	0.05	Sanaiotti et al. (1996)
92	APG*	Gleba de Pedreira, AP	00°40′N 51°45′W	19 (1)	0	0	Sanaiotti et al. (1996)
93	APM*	36km N of Macapá, AP	00°20′N 51°05′W	15	0	0	Sanaiotti et al. (1996)
94	APN*	114km N of Macapá, AP	00°46′N 51°18′W	11	0	0	Sanaiotti et al. (1996)
95	APT*	Tartarugalzinho, AP	01°40′N 50°50′W	7	0	0	Sanaiotti et al. (1996)
96	RRD*	Roraima, RR	03°48′N 59°46′W	6 (1)	0	0	Dantas & Rodrigues (1982)
97	RRM*	Ilha da Maracá, RR	03°22′N 61°26′W	8 (3)	0	0	Milliken & Ratter (1989)
98	RRT*	Boa Vista, RR	03°20′N 61°26′W	11	1	0.09	Takeuchi (1960)

excluded. In some cases it is difficult to decide whether a species should qualify for inclusion or not and readers may disagree with some of the choices. As yet, data are insufficient to allow extensive phytogeographic comparisons including species of the 'ground layer' ('vegetação rasteira'). In the rare instances where detailed floristic lists including the ground layer are available (e.g. Ratter, 1986; Pereira et al., 1993), they record four to six times the number for small species as for trees, and thus collection of data is a much greater task. A list of the taxa used in the analyses is given in Appendix 1; all are identified to species level since taxa with less complete determinations (vernacular name, etc.) do not provide a reliable basis for comparison.

Detailed soil data are available for some studies but there is no information for many sites. However, presence of mesotrophic soils in areas where no soil analyses are available is inferred by the occurrence of indicator species of richer soils (see Ratter et al., 1977, 1978), marked in bold in Appendix 1. A 'Mesotrophic Index' consisting of the no. of mesotrophic soil indicator species/total no. of species was calculated for all sites as a basis for comparison. Such an index is of some use, but a 'Mesotrophic Importance Index' based on Importance Value Index, Cover Value Index or basal area would be much better, since in many mesotrophic communities the indicator species have high values for these parameters, while many other species are present but relatively unimportant as constituents of the total vegetation. Unfortunately, however, data are not available to calculate a mesotrophic importance index for most of the sites considered.

Data analysis

The general approach used is the same as in Oliveira-Filho & Ratter (1995), which is essentially similar to that of Ratter & Dargie (1992) but with the addition of the agglomerative hierarchical classification based on the Sørensen Coefficient of Community.

Three techniques of multivariate analysis, corresponding to different methodological approaches, were used. The purpose was to seek patterns that could be accentuated in common by different analytical procedures. The techniques were: (a) a divisive hierarchical classification by Two-way Indicator Species Analysis (TWINSPAN) (Hill, 1979), (b) an agglomerative hierarchical classification by UPGMA (Unweighted Pair-Groups Method using Arithmetic Averages) using the Sørensen Coefficient of Community (CC) as a measure of similarity (Kent & Coker, 1992), and (c) an ordination by Detrended Correspondence Analysis (DCA) (Hill & Gauch, 1980).

For DCA and TWINSPAN, we used the versions contained in the package VESPAN 11 (Malloch, 1988). The floristic matrix analysed by both methods had 376 species and 98 areas as a result of the elimination of 158 species occurring in only one area, following the procedures described in Ratter & Dargie (1992). However, we carried out UPGMA analyses using both the floristic matrix with

elimination of unicates, as used for DCA and TWINSPAN, and the full matrix with 534 species. The CCs were calculated with a program written in FORTRAN and processed by the package NTSYS (Rohlf, 1992) in order to produce the clustering dendrogram.

RESULTS AND DISCUSSION

A total of 534 species were recorded in the 98 areas, of which 158 (30%) are unicates occurring only at a single locality. Appendix 1 gives a list of species occurring at more than one site and the number of sites at which they occurred, while Appendix 2 lists the unicates. Space does not allow the table of species occurrence at all sites to be reproduced here but copies are available from the authors. As in our previous study (Ratter & Dargie, 1992), none of the species occurs at all sites, but the most widespread species is again *Qualea grandiflora* which has 80 occurrences (=81.6%). Only the 28 species listed in Table 2 were recorded at 49 (50%) or more of the sites.

It is interesting that Ratter & Dargie (1992) recorded 485 species from only 26 areas and of these 230 were unicates. Thus, despite a near quadrupling of the number of sample sites, species recorded have only increased by 10% while, as expected, the number of unicates has fallen quite steeply: clearly the species/site curve is flattening off. However, the number of species occurring at a high percentage of sites has actually declined with the increase of the comparison from 26 to 98 areas. Ratter & Dargie (1992) recorded 27 species occurring in 15 or more sites (=58% of the 26 sites sampled); however, it is more logical to use the figure for 50% (13 sites) and this increases the number of species in common to 41. Thus, in these terms, we see an increase in heterogeneity, since 41 species were common to 50% of the sites in

TABLE 2. Species occurring at 49 (50%) or more sites. The figures indicate the percentage of sites where the species occurs, with equivalent values from Ratter & Dargie (1992) in parentheses.

Acosmium dasycarpum	60% (53%)	*Hymenaea stigonocarpa*	66% (58%)
Annona crassiflora	52% (42%)	*Kielmeyera coriacea*	65% (58%)
Astronium fraxinifolium	52% (54%)	*Lafoensia pacari*	62% (58%)
Bowdichia virgilioides	76% (73%)	*Machaerium acutifolium*	55% (58%)
Brosimum gaudichaudii	53% (50%)	*Pouteria ramiflora*	51% (58%)
Byrsonima coccolobifolia	71% (77%)	*Qualea grandiflora*	82% (88%)
B. verbascifolia	55% (61%)	*Q. multiflora*	54% (61%)
Caryocar brasiliense	66% (69%)	*Q. parviflora*	60% (69%)
Connarus suberosus	60% (69%)	*Roupala montana*	62% (50%)
Copaifera langsdorfii	51% (50%)	*Salvertia convallariodora*	53% (54%)
Curatella americana	71% (77%)	*Tabebuia aurea*	56% (69%)
Dimorphandra mollis	65% (65%)	*T. ochracea*	57% (35%)
Erythroxylum suberosum	54% (65%)	*Tocoyena formosa*	58% (73%)
Hancornia speciosa	51% (42%)	*Xylopia aromatica*	57% (58%)
			Total: 28 species

Ratter & Dargie (1992) but only 28 species in the present more extensive study. Percentage occurrences for these 28 species in both studies are given in Table 2; in the main they show a high degree of correspondence.

Seventeen species recorded with an occurrence of 50% or more in Ratter & Dargie (1992) are not in the present top 28 (Table 2). These are, with percentage occurrences in this study followed by those in Ratter & Dargie (1992) in parentheses: *Annona coriacea* 42% (50%), *Aspidosperma tomentosum* 42% (65%), *Casearia sylvestris** 48% (65%), *Cochlospermum regium** 20% (50%), *Davilla elliptica** 40% (61%), *Eriotheca gracilipes* 32% (50%), *Erythroxylum tortuosum** 37% (58%), *Magonia pubescens* 38% (61%), *Plathymenia reticulata* 47% (58%), *Sclerolobium aureum* 40% (54%), *Strychnos pseudoquina* 40% (50%), *Stryphnodendron adstringens* 44% (54%), *Terminalia argentea* 38% (58%), *Vatairea macrocarpa* 41% (54%), and *Vernonia ferruginea** 21% (54%). Of these, the species marked with an asterisk are usually small and have probably been excluded from many surveys because they failed to reach qualifying size.

The species list (Appendix 1) can be used to give an idea of the most abundant and widespread cerrado tree species; for instance, the 98 species with 20 or more occurrences could be taken as a reasonable working list of the commonest tree species of the cerrado. It is interesting that some of these widely dispersed species seem in our experience to be always of sparse occurrence, e.g. *Cybistax antisyphilitica* and, to a lesser extent, *Agonandra brasiliensis*.

Multivariate analyses

The multivariate analyses of the floristic data show a great deal of coincidence in the patterns arising from the three techniques used. All demonstrate a similar geographic pattern in the groupings obtained. A detailed description and discussion of the results are given below.

1. Divisive hierarchical classification (TWINSPAN) site hierarchy

The site hierarchy produces 12 groups after four levels of division (Fig. 2). A fifth level of division gives 19 groups but, in the main, those produced by only four divisions are more meaningful and for this reason are the groups we discuss below. Details of the divisions and the indicator species on which they are partly based are too lengthy to reproduce here but are available from the authors. The groupings produced by the analysis are mapped in Fig. 3.

Interpretation of grouping. The main features of groups and group sets are as follows:

Group 1: This group comprises three diverse localities in São Paulo, Mato Grosso do Sul and Goiás, all recorded in the pioneer study of Ferri & Coutinho (1958), together with one from Humaitá, Amazonas (86 AMH). The species totals of the first three localities are low (33, 24 and 29 respectively) and they are the only sites

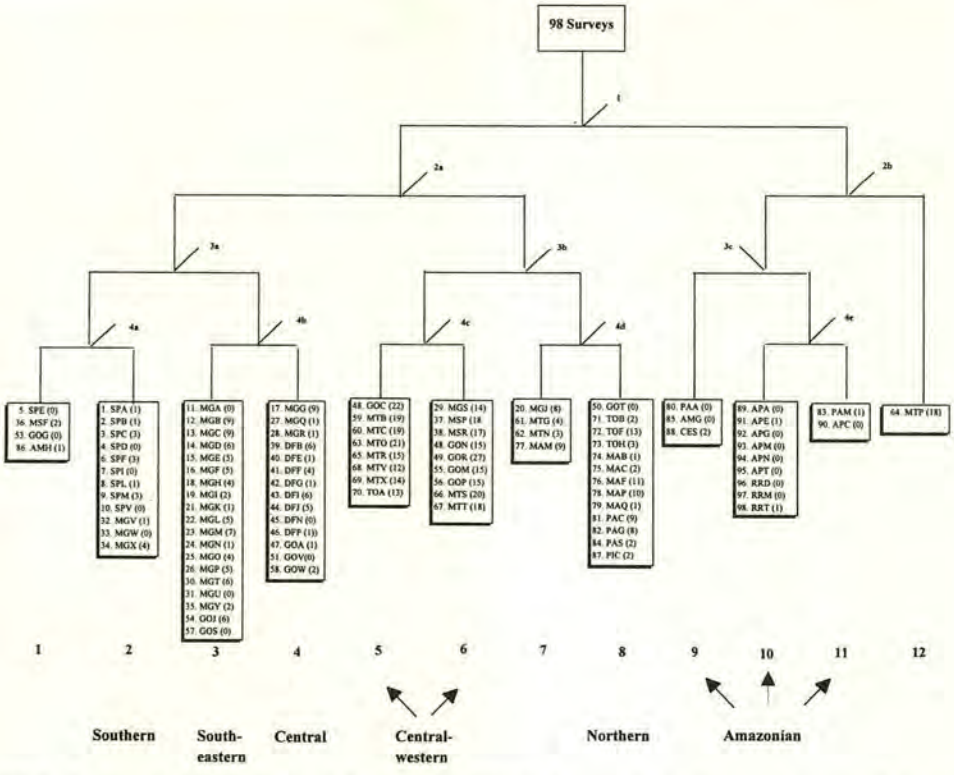

FIG. 2. Site hierarchy derived from TWINSPAN data analysis. Site codes as in Table 1. Figures in parentheses after site code represent the number of mesotrophic soil indicator species for that location. The figures below are the group numbers discussed in the text.

lacking any unicate species. Forty-six species are recorded for the Humaitá site of which nine are unicates.

Group 2: This is a geographically very natural group consisting of all 10 São Paulo sites included in the analysis, apart from the anomalous 5 SPE in Group 1, and three sites from the Rio Grande region of southern Minas Gerais, close to the São Paulo border (Carvalho, 1987). A further (fifth) level of division separates the Minas from the São Paulo sites. All of the sites show low occurrences of mesotrophic indicator species.

Group 3: Like the previous, this forms a clearly natural group. It consists of 17 sites from Minas Gerais, covering most of the latitudinal and longitudinal range of the state, and two in the southern part of Goiás. The number of mesotrophic indicator species in most of the sites is relatively low.

Group 4: This again is a very natural group. It consists of 13 sites from the Federal District, Minas Gerais and Goiás. As in the previous groups, the number of mesotrophic species in most of the sites is relatively low.

FIG. 3. Map showing the geographical pattern of the groups defined by TWINSPAN. Southern sites are group 2; southeastern, 3; central, 4; central-western, 5 & 6; northern, 8; disjunct Amazonian, 9–11. Where two or more sites are in close proximity they are represented by a single dot with a figure denoting the number of sites. 'Misclassified' sites are indicated by solid squares and code-letters.

Groups 5 & 6: These contain the sites rich in mesotrophic indicator species and have a strong floristic affinity despite the level of division separating them. They are from the states of Goiás, Mato Grosso, Mato Grosso do Sul, Tocantins on the Mato Grosso border (Ilha do Bananal) and, in one case, northern Minas Gerais (Sagarana).

Group 7: This consists of two sites from Cuiabá, Mato Grosso, one from Januária, northern Minas Gerais, and one from Carolina, Maranhão, all of which have relatively small numbers of species. The Carolina site has the highest mesotrophic index recorded in the study (nine mesotrophic species out of 22 recorded = 0.41) and the index is also very high for Januária (0.21).

Group 8: This is another geographically natural group, as can be seen on the maps (Figs 1, 3). It has a northern distribution in the states of Maranhão, Piauí, Tocantins and Pará, but includes a single site from Goiás (56 GOP). The disjunct cerrado at

FIG. 4. Map showing the geographical pattern of the groups defined by UPGMA. Where two or more sites are in close proximity they are represented by a single dot with a figure denoting the number of sites present. 'Misclassified' sites are indicated by a solid squares and code-letters.

Alter do Chão, Pará, which is comparatively species-rich in terms of isolated Amazonian sites, is included in this group but separates from the other sites at the next (fifth) level of division.

Groups 9, 10 & 11: With the exception of an anomalous site in Ceará falling into Group 9, these are all species-poor Amazonian savannas, the majority situated north of the River Amazon.

Group 12: This consists of one site only, Poconé in the Mato Grosso Pantanal (64 MTP). It was separated from all the other 'core area' sites by the uppermost dichotomy in the classification, and seems to be misclassified. In the original analysis of 26 areas by Ratter & Dargie (1992) it was grouped with another Pantanal site from Mato Grosso do Sul (38 MSR) and another Mato Grosso site (67 MTT), all of which were regarded as misclassified. These three sites all have high numbers of mesotrophic soil indicator species and, intuitively, it was thought they should be

correctly placed amongst the groups showing this character. This has, in fact, happened in the present analysis for both MSR and MTT which are now classified in Group 6. MTP, however, remains literally 'out on a limb', classified on the branch of the disjunct Amazonian sites.

Classification pattern summary. Various features emerge from the interpretation of the classification hierarchy. The first is a strong geographical pattern of grouping (see Figs 2, 3) with southern sites (Group 2, São Paulo and southern Minas Gerais), southeastern sites (Group 3, largely Minas Gerais), central sites (Group 4, Federal District, Goiás and parts of Minas Gerais), central-western sites (Groups 5 & 6, largely Mato Grosso, Goiás and Mato Grosso do Sul) and northern sites (Group 8, Maranhão, Tocantins, Piauí and Pará), as well as the disjunct group of Amazonian savannas (Groups 9–11). The second is the distinction of groups with largely dystrophic soils (Groups 1–4 and, to some extent, 7 and 8) from those with more mesotrophic soils (Groups 5 & 6), as judged by the presence of indicator species, backed up in many cases by soil analyses. Such soil differences often over-ride spatial proximity, producing strong beta-diversity (Whittaker, 1967) in a small geographical area, as shown for example by the separation of the dystrophic (Group 4) and mesotrophic sites (Group 6) from the Chapada dos Veadeiros, Goiás. More minor features indicate a number of under-recorded sites in Group 1, and at least one grossly misclassified site (64, Mato Grosso, Poconé, Group 12).

2. Agglomerative hierarchical classification (UPGMA)

Analyses were made using (i) the same data matrix as for TWINSPAN and DCA, and (ii) the full data matrix of 534 species. The former uses a slightly modified Sørensen Coefficient of Community since unicate species (occurring at only a single site) are excluded. Both of these analyses showed a high level of correspondence and produced the same recognizable patterns as in TWINSPAN, but that derived from the matrix minus unicates was undoubtedly superior in terms of geographical fit and other factors. The explanation of this is perhaps that addition of unicates produces irrelevant 'noise': many of them are undoubtedly 'rogues', including, for instance, non-cerrado species from bordering vegetation types (gallery forests, etc.), misidentifications, unrecognized synonyms, etc. The analysis reported here is therefore that based on the data matrix with unicates excluded. There seems to be little point in publishing the other and giving details of the minutiae by which the two differ; however, these data are available from the authors.

Most patterns already indicated by TWINSPAN appear in the UPGMA dendrogram (Fig. 5), the map (Fig. 4) and the Minimal Spanning Tree (Fig. 6); in fact the correspondence between the two approaches is extremely close, as demonstrated by the two maps (Figs 3, 4). This close agreement of the results derived from the two methods coincides with the findings of Oliveira-Filho & Ratter (1995) in a similar study of species distribution patterns in Central Brazilian forests. The main features of the classification and differences between it and TWINSPAN are dealt with below.

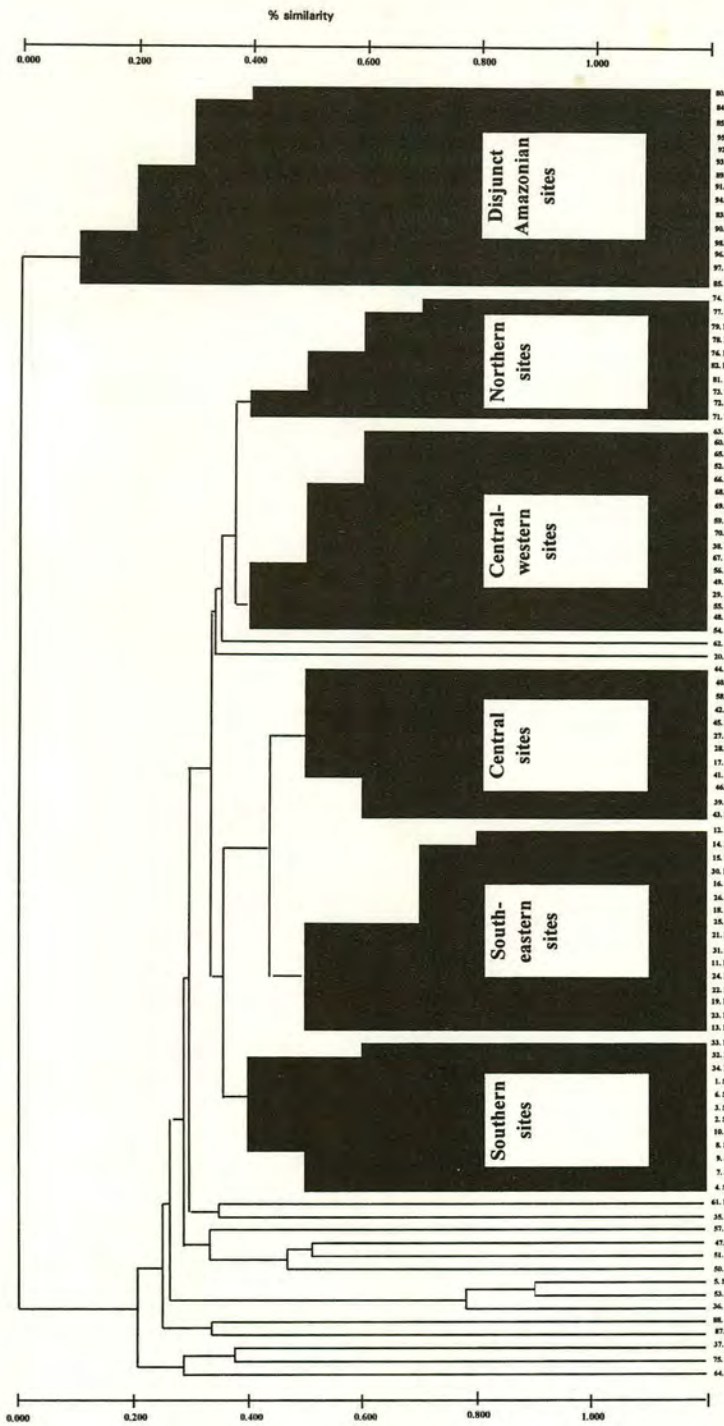

FIG. 5. Similarity dendrogram yielded by UPGMA, using Sørensen Coefficients of Community. Site codes as in Table 1. 'Misclassified' sites indicated by asterisks.

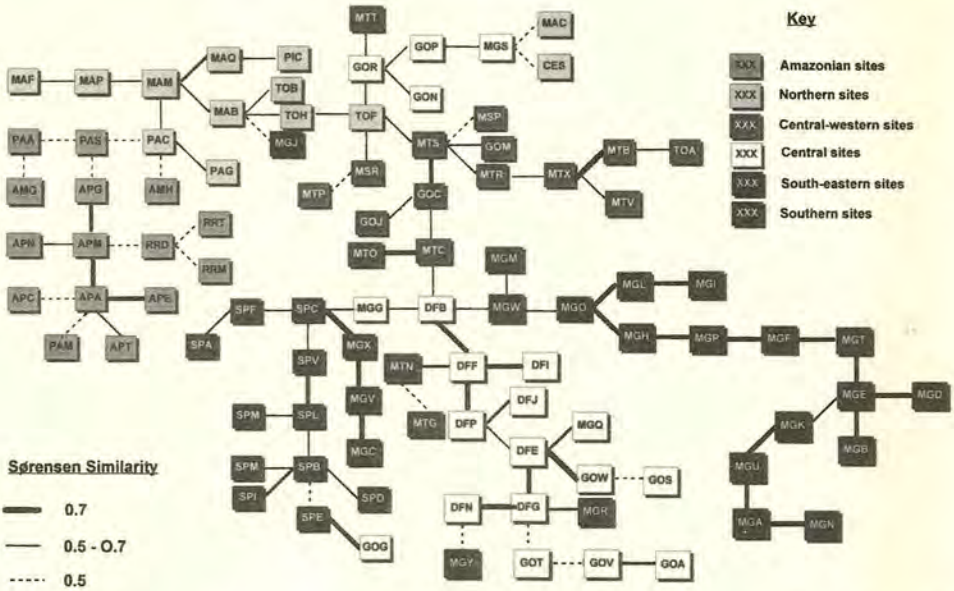

FIG. 6. Minimal spanning tree of Sørensen Coefficients of Community. Site codes as in Table 1 but without numbers.

The southern sites (Fig. 5) coincide exactly with TWINSPAN Group 2, comprising nine sites from São Paulo and three sites from Minas Gerais close to the São Paulo border.

The central sites correspond to Group 4 of TWINSPAN, while the southeastern consist of Group 3 with one Minas site (35 MGY) and the two Goiás sites (54 GOJ and 57 GOS) removed. The southeastern group as defined by UPGMA consists of 16 sites covering most of the state of Minas Gerais.

The central-western sites of Fig. 5 correspond to Groups 5 and 6 of TWINSPAN Fig. 2, consisting of sites rich in mesotrophic indicator species and showing a strong geographic relationship. Site 50 GOJ (Goiás, Jataí) has now been classified within this group, nearest to its closest neighbour, 51 GOM (Goiás, between Caiapônia and Mineiros), lying only 80km distant. By TWINSPAN 50 GOJ was placed in Group 3 with another site from Goiás and two from Minas Gerais. The TWINSPAN classification could be defended but certainly that provided by UPGMA is more natural.

The northern sites of Fig. 5 consist of Group 8 of TWINSPAN but with the removal of the single Piauí site (87 PIC) and the aberrant Goiás 56 GOT. The group as defined by UPGMA is now confined to Maranhão, Tocantins and Pará.

The disjunct Amazonian savannas of the UPGMA classification include all sites placed in Groups 9–11 of TWINSPAN with the addition of the Alter do Chão, Pará (84 PAS) and Humaitá, Amazonas (86 AMH) sites. Obviously the inclusion of the last two sites in this grouping is logical. The inclusion by TWINSPAN of Humaitá

in the very anomalous Group 1 seems to have little or no natural basis and can be considered a misclassification, but on the other hand the classification of Alter do Chão in the main Pará, Maranhão and Tocantins group (8) seems to indicate a real affinity. The UPGMA classification also removes the misclassified Ceará site, 88 CES, from the disjunct Amazonian category, where it was placed by TWINSPAN in Group 9, while the very anomalous Mato Grosso Poconé (64 MTP) from the Pantanal is also removed from this branch. The Minimal Spanning Tree (Fig. 6) demonstrates that the similarity indices between these disjunct Amazonian sites are in general much lower than those occurring in the other groupings.

Outside these main natural groupings there remain 16 sites, many of which are anomalous in their classification, and once again these largely correspond in both UPGMA and TWINSPAN. One natural group amongst these consists of three cerrado rupestre sites from the Chapada dos Veadeiros (47 GOA, 57 GOV and 56 GOT) which were rather unnaturally divided between Groups 4 and 8 by TWINSPAN. The three sites of Ferri & Coutinho (1958) in Group 1 of TWINSPAN also remain together in the UPGMA classification. Low species number is a characteristic of some of these sites which are difficult to fit into any groups of natural affinity (see Table 1).

3. Ordination (DCA)

The ordination of the sites on the two principal axes is given by Fig. 7. Fourteen disjunct Amazonian sites and other outliers were not entered in the analysis, since their inclusion caused excessive clumping of the other sites. The results agree closely with those given by TWINSPAN and Sørensen/UPGMA, showing similar groupings of southern, southeastern, central, central-western and northern sites.

It is interesting to see the positions of some of the sites regarded as perhaps misclassified by TWINSPAN. Alter do Chão (84 PAS) is placed in the northern group close to the other Pará sites; this is fairly close to its TWINSPAN classification in which it constitutes a separate group most closely related to the other northern sites. It is striking that the Poconé site (64 MTP), placed so much 'out on a limb' by TWINSPAN, is in the same position here.

DCA does not enforce a dichotomous hierarchy and the correspondence of the groupings produced by it with those from TWINSPAN and Sørensen/UPGMA show that the patterns of the data set are not being obscured by the imposition of a hierarchy in the latter two methods.

GENERAL DISCUSSION AND CONCLUSIONS

The most striking result of this study is the demonstration of a very strong geographical pattern in the distribution of the flora of the cerrado biome. This emerges from all three methods of analysis, which in themselves show a remarkable level of agreement. Such a pattern was indicated by Ratter & Dargie (1992) but the increase in the number of sites compared from 26 to 98 provides much more reliable information.

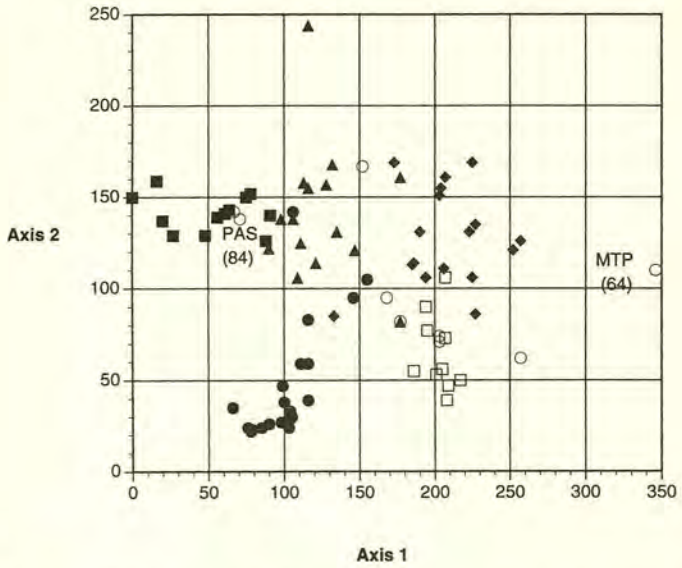

FIG. 7. Ordination of the sites on the first two DCA axes. To avoid excessive clumping of the other sites, some disjunct Amazonian sites and other outliers are not included. These are marked by asterisks in Table 1. The symbols give the geographical groups indicated by TWINSPAN and UPGMA: ■, southern; ● , southeastern; ▲, central; ◆, central-western; □, northern; ○, misclassified. 64 MTP = Poconé, Mato Grosso, and 84 PAS = Alter do Chão, Pará (see text, p. 169).

We do not consider that the patterns so far discovered are sufficient to postulate firm phytogeographic subprovinces within the cerrado region: the terms we have used (southern, southeastern, central, central-western, northern, and disjunct Amazonian) refer to objectively demonstrated groupings, but more information is necessary before they can be defined with rigour. However, the ever-increasing research referred to in the introduction means that there should soon be much more information available for accurate formulation of biogeographic patterns in the cerrado biome. It is particularly interesting that the results of the comparable research of A.A.J.F. Castro (1994a, b) seem largely in accord with our own. In the future, a synthesis of the two studies should provide very valuable conclusions.

Climate, and particularly overall precipitation and length of dry season, are undoubtedly important factors in the distribution of cerrado vegetation. The recent work of L.H.R. de Castro et al. (1994) has demonstrated great variability in these factors and identified at least five precipitation groups within the cerrado region. These groups differ particularly in duration and time of occurrence of the dry season. As would be expected, the groups show a strong geographic pattern and a detailed correlation of them with our phytogeographic data is a priority for future work. Other environmental factors, such as the effect of altitude, are also of great importance and will have to be studied in the future.

A number of other points emerge from, or are emphasized by, this study. For

instance, as shown in previous research (e.g. Ratter et al., 1977; Ratter & Dargie, 1992), occurrence of mesotrophic soils in cerrado areas is a factor of great importance, since there is a characteristic flora associated with such soils. A large number of mesotrophic sites, principally from Mato Grosso, Mato Grosso do Sul and Goiás, are grouped together by all three analysis techniques used in this study. Information is also shed on the isolated Amazonian savannas included in the analysis. Of these, only Alter do Chão, Pará (84 PAS) and Humaitá, Amazonas (86 AMS), with 48 and 46 species recorded respectively, really seem to represent disjunct islands of species-rich cerrado. The rest are floristically depauperate areas dominated by a few species, usually of the cerrado flora, and often fall into the category of hydrologic savanna.

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APPENDIX 1

Species used in the analyses (present at two or more localities). The figures give the number of sites at which species occur. Species indicating richer (mesotrophic) soils are in bold.

***Acacia paniculata* Willd.** 8
Acosmium dasycarpum (Vogel) Yakovlev 59
A. subelegans (Mohl) Yakovlev 19
***Acrocomia aculeata* (Jacq.) Lodd. ex Mart.** (=*A. sclerocarpa* Mart.) 12
Aegiphila lhotskyana Cham. 34
A. paraguariensis Briq. 4
A. verticillata Vell. 2
Agonandra brasiliensis Miers 33
Alchornea triplinerva Müll.Arg. 2
Alibertia concolor (Cham.) K.Schum. 4
A. edulis (L.Rich.) A.Rich. 28
A. elliptica (Cham.) K.Schum. 2
A. macrophylla K.Schum. 3
A. obtusa Cham. 2
A. sessilis (Cham.) K.Schum. 14
A. verrucosa Moore 2
Amaioua guianensis Aubl. 2
Anacardium occidentale L. 24 (=*A. microcarpum* Ducke)
***Anadenanthera colubrina* (Vell.) Brenan** 9
***A. peregrina* Speg.** 15
Andira cordata Arroyo ex R.T.Pennington 2
A. cuiabensis Benth. 17
A. inermis Kunth 4
A. vermifuga Mart. 24
Annona coriacea Mart. 41
A. crassiflora Mart. 51
A. paludosa Aubl. 5
Antonia ovata Pohl 17
Apeiba tibourbou Aubl. 9
Aspidosperma macrocarpon Mart. 29
A. multiflorum A.DC. 6
A. nobile Müll.Arg. 8
A. olivaceum Müll.Arg. 2
A. parvifolium A.DC. 3
***A. subincanum* Mart.** 14
A. tomentosum Mart. (=*A. dasycarpon* A.DC.) 41
***Astronium fraxinifolium* Schott** 51
***A. urundeuva* Engl.** 18
Attalea speciosa Mart. ex Spreng. (=*Orbignya phalerata* Mart.) 2
Austroplenckia populnea (Reiss.) Lundell. 36

Banisteriopsis dracunculifolia DC. 7
B. latifolia (A.Juss.) Cuatrec. 10
B. pubipetala (A.Juss.) Cuatrec. 3
***Bauhinia cupulata* Benth.** 2
B. forficata Link. 5
B. holophylla Steud. 7
B. rufa (Bong.) Steud. 18
B. tenella Benth. 2
Blepharocalyx salicifolius (Kunth) Berg (=*B. suaveolens* (Cambess.) Burret) 9
Bowdichia virgilioides Kunth (=*B. major* Mart.) 75

Bredmeyera altissima A.W.Benn. 4
Brosimum gaudichaudii Trécul 52
***Buchenavia tomentosa* Eichler** 10
Butia leiospatha (Mart.) Becc. 8
Byrsonima basiloba A.Juss. 10
B. coccolobifolia Kunth 70
B. coriacea DC. 3
B. crassa Nied. 32
B. crassifolia (L.) Kunth 39
B. cydoniifolia A.Juss. 3
B. fagifolia Nied. 2
B. guillerminiana A.Juss. 2
B. intermedia A.Juss. 17
B. orbignyana A.Juss. 2
B. pachyphylla A.Juss. 7
B. verbascifolia Rich. ex A.Juss. 54

***Callisthene fasciculata* (C.K.Spreng.) Mart.** 23
C. major Mart. 13
Calophyllum brasiliense Cambess. 4
***Calycophyllum multiflorum* Griseb.** 2
Campomanesia adamantium (Cambess.) Berg (= *C. cambessedeana* Berg) 2
C. eugenioides Blume 5
C. pubescens (DC.) Berg 21
Cardiopetalum calophyllum Schltdl. 10
Caryocar brasiliense Cambess. 65
C. coriaceum Wittm. 6
Casearia arborea Urb. 6
C. decandra Jacq. 3
C. grandiflora Cambess. 16
***C. rupestris* Eichler** 2
C. sylvestris Sw. 47
Cecropia pachystachya Trécul 7
Cenostigma macrophyllum Tul. 2
Chaetocarpus echinocarpus (Baill.) Ducke 3
Chamaecrista orbiculata (Benth.) Irwin & Barneby 2
Cheiloclinium cognatum (Miers) A.C.Sm. 2
Chomelia obtusa Cham. & Schltdl. 2
C. ribesioides Benth. 12
Chrysophyllum marginatum Radlk. 4
Coccoloba mollis Casar. 3
Cochlospermum regium (Schrank) Pilg. 20
***Combretum duarteanum* Cambess.** 4
***C. leprosum* Mart.** 6
Connarus suberosus Planch. 59
Copaifera langsdorfii Desf. 50
C. martii Hayne 6
Cordia alliodora (Ruíz & Pav.) Oken 4
***C. glabrata* (Mart.) A.DC.** 6
C. insignis Cham. 5
C. sellowiana Cham. 2
***C. trichotoma* (Vell.) Arrab.** 7
Couepia grandiflora (Mart. & Zucc.) Benth. 38
Coussarea hydrangeaefolia Benth. & Hook.f. 5
Curatella americana L. 70
Cybianthus detergens Mart. 9
Cybistax antisyphilitica Mart. 32

Dalbergia miscolobium Benth. (=*D. violacea* (Vogel) Malme) 47
Daphnopsis fasciculata (Meissn.) Nevling 3
Davilla elliptica A.St.-Hil. 39
D. grandiflora A.St.-Hil. & Tul. 2
Didymopanax distractiflorum Harms 6
D. macrocarpum (Cham. & Schltdl.) Seem. 38
D. vinosum (Cham. & Schltdl.) March. 15
***Dilodendron bipinnatum* Radlk.** 19
Dimorphandra mollis Benth. 64
Diospyros burchellii Hiern 8
D. camporum Warm. 2
D. hispida DC. 37
D. sericea DC. 15
***Dipteryx alata* Vog.** 23
Diptychandra aurantiaca (Mart.) Tul. 4
D. glabra Benth. 2
Duguetia furfuracea (A.St.-Hil.) Benth. & Hook. 20

Emmotum nitens (Benth.) Miers 34
***Enterolobium contortisiliquum* (Vell.) Morong** 7
E. gummiferum J.Macbr. 38
Eremanthus glomerulatus Less. 18
E. goyazensis Sch. Bip. 5
E. mattogrossensis Kuntze 5
Eriotheca gracilipes (Schum.) Robyns 31
E. pubescens (Mart. & Zucc.) Schott. & Endl. 16
Erythroxylum ambiguum Peyr. 4
E. cuneifolium Poepp. ex O.E.Schulz 3
E. deciduum A.St.-Hil. 20
E. suberosum A.St.-Hil. 53
E. tortuosum Mart. 36
Eugenia aurata O.Berg 11
E. bimarginata DC. 9
E. dysenterica DC. 31
E. punicifolia (Kunth) DC. 2
E. uniflora L. 2
Eupatorium squalidum DC. 3
Euplassa inaequalis (Pohl) Engl. 5

Fagara hassleriana Chodat 2
F. rhoifolia (Lam.) Engl. 28
***F. riedeliana* Engl.** (=*F. cinerea* Engl.) 16
Ferdinandusa elliptica Pohl 15

Genipa americana L. 5
Gochnatia barrossii Cabrera 4
G. pulchra Cabrera 4
Gomidesia lindeniana Berg 4
Guatteria sellowiana Schltdl. 3
***Guazuma ulmifolia* Lam.** 31
Guettarda viburnioides Cham. & Schltdl. 24

Hancornia pubescens Nees & Mart. 2
H. speciosa Nees & Mart. 50
Heisteria densifrons Engl. 3
Helicteres corylifolia Nees & Mart. 2
***H. macropetala* A.Juss.** 5
H. sacarolha A.St.-Hil. 4
Heteropteris byrsonimifolia A.Juss. 18
H. tomentosa Hook. & Arn. 2
Himatanthus articulatus (Vahl) Woodson 8
H. bracteatus (A.DC.) Woodson 2
H. obovatus (Müll.Arg.) Woodson 44
Hirtella ciliata Mart. ex Zucc. 9
H. glandulosa Spreng. 19
Humiria balsamifera A.St.Hil. 2
Hymenaea courbaril L. 11
H. stigonocarpa Mart. ex Hayne 65
Hyptidendron canum (Pohl ex Benth.)Harley (= *Hyptis cana* Pohl ex Benth.) 15

Ilex cerasifolia Reissek 4
I. concocarpa Reissek 4

Jacaranda brasiliana Pers. 9
J. caroba (Vell.) DC. 10
***J. cuspidifolia* Mart.** 10

Kielmeyera coriacea (Spreng.) Mart. 64
K. corymbosa Mart. 3
K. grandiflora (Wawra) Saddi 3
K. lathrophyton Saddi 5
K. rosea Mart. 5
K. rubriflora A.St.-Hil. 21
K. speciosa A.St.-Hil. 10

Lacistema aggregatum (Berg) Rusby 5
L. floribundum Miq. 2
Lafoensia densiflora Pohl 6
L. pacari St. Hil. 61
Lamanonia ternata Vell. 2
Leandra involucrata Raddi 2
L. lacunosa Cogn. 3
Licania gardneri Kuntze 3
L. humilis Cham. & Schltdl. 15
L. sclerophylla Mart. ex Hook.f. 2
***Linociera hassleriana* (Chodat) Hassler** 2
Lippia corymbosa Cham. 2
Lithraea molleoides (Vell.) Engl. 5
***Luehea candicans* Mart.** 3
L. divaricata Mart. 8
***L. paniculata* Mart.** 25
***L. speciosa* Willd.** 9
Lychnophora ericoides Mart. 2

Mabea fistulifera Mart. 4
Macairea radula DC. 2
Machaerium acutifolium Vogel 54
***M. angustifolium* Mart. ex Benth.** 3
M. opacum Vogel 25
***M. scleroxylon* Tul.** 4
M. villosum Vogel 3
***Magonia pubescens* A.St.-Hil.** 37
Manihot tripartita Müll.Arg. 3
Maprounea guianensis Aubl. 13
Matayba guianensis Aubl. 23
Mezilaurus crassiramea (Meissn.) Taub. 8
Miconia albicans (Sw.) Triana 42
M. burchellii Triana 5
M. chartacea Triana 2
M. fallax DC. 3
M. ferruginata DC. 15
M. holosericea (L.) DC. 2
M. langsdorfii Cogn. 2
M. ligustroides Naud. 8
M. macrothyrsa Benth. 2
M. nervosa Triana 2
M. pohliana Cogn. 11
M. rubiginosa (Bonpl.) DC. 12
M. sellowiana Naud. 6
M. stenostachya DC. 9
Mimosa clausennii Benth. 9
M. laticifera Rizzini & Mattos 6
M. manidea Barneby 2
M. obovata Benth. 2
Mouriri elliptica Mart. 16
M. pusa Gardner 8
Myrcia albo-tomentosa Cambess. 9
M. canescens Berg 2
M. fallax (Rich.) DC. 2
M. formosiana Cambess. 2
M. intermedia Kiaersk. 2
M. lasiantha DC. 5
M. lingua (Berg) Mattos 8
M. multiflora DC. 2
M. pallens DC. 3
M. pubipetala Miq. 3
M. rostrata DC. 6
M. sellowiana Berg 2
M. superba Berg 2
M. tomentosa (Aubl.) DC. 17
M. uberavensis Berg 6
M. variabilis DC. 7
M. velutina Berg 5

Neea spruceana Heim. 2
N. theifera Oerst. 34

Ocotea acutifolia (Nees.) Mez 2
O. pomaderrioides Mez 2
O. pulchella Mart. 9
O. spixiana (Nees) Mez 4
O. suaveolens Hassl. 2
Ouratea castaneaefolia Engl. 19

O. hexasperma (A.St.-Hil.) Benth. 40
O. spectabilis (Mart.) Endl. 17

Palicourea rigida Kunth 39
Parkia platycephala Benth. 7
***Peltogyne confertiflora* (Hayne) Benth.** 8
Pera glabrata (Schott.) Baill. 15
Phoebe erythropus (Nees, Mart. & Spix) Mez 3
***Physocallyma scaberimmum* Pohl** 11
Piptocarpha rotundifolia (Less.) Baker 41
Pisonia graciliflora Mart. (=*P. subferruginosa* Mart. ex J.A.Schmidt) 8
P. noxia Netto 26
P. psammophila Mart. ex J.A.Schmidt 3
Plathymenia reticulata Benth. 46
Platonia insignis Mart. 3
***Platypodium elegans* Vogel** (=*P. grandiflorum* Benth.) 28
Pouteria ramiflora (Mart.) Radlk. 50
P. torta (Mart.) Radlk. 22
Protium heptaphyllum (Aubl.) E.K.Marchal 19
Prunus brasiliensis (Cham. & Schltdl.) D.Dietr. 2
Pseudobombax longiflorum (Mart. & Zucc.) Robyns 47
***P. marginatum* (A.St.-Hil., A.Juss. & Cambess.) Robyns** 8
***P. tomentosum* (Mart. & Zucc.) Robyns** 19
Psidium araça Raddi 2
P. myrsinoides Berg 7
P. warmingianum Kiaersk 8
Psychotria sessilis Vell. 3
Pterodon polygalaeflora Benth. 12
P. pubescens Benth. 30

Qualea cordata Spreng. 4
Q. dichotoma (Mart.) Warm. 11
Q. grandiflora Mart. 80
Q. multiflora Mart. 53
Q. parviflora Mart. 59

Rapanea ferruginea (Ruiz & Pav.) Mez 8
R. guianensis Aubl. 23
R. lancifolia Mez 4
R. umbellata Mez 9
***Rhamnidium elaeocarpum* Reiss.** 14
Roupala brasiliensis Klotzsch 10
R. gardneri Meissn. 2
R. heterophylla Pohl 3
R. montana Aubl. 61
Rourea induta Planch. 20
Rudgea amazonica Müll.Arg. 3
R. viburnioides (Cham.) Benth. 22

Sacoglottis guianensis Benth. 2
Salacia crassifolia (Mart.) Peyr. 23
S. elliptica G.Don 2
Salvertia convallariodora A.St.-Hil. 52
Sapium marginatum Müll.Arg. 4
Schinus terebinthifolius Raddi 13
Sclerolobium aureum (Tul.) Benth. 39
S. paniculatum Vogel 37
Senna rugosa (G.Don) Irwin & Barneby (=*Cassia rugosa* G.Don) 5
S. silvestris (Vell.) Irwin & Barneby (=*Cassia sylvestris* Vell.) 3
S. uniflora (P.Mill.) Irwin & Barneby (=*Cassia uniflora* Mill.) 2
Simarouba amara Aubl. 5
S. versicolor A.St.-Hil. 37
Siparuna guianensis Aubl. 27
Siphoneugena densiflora Berg 6
Solanum crinitum Lam. 2
S. grandiflorum Desf. 4
S. lycocarpum A.St.-Hil. 24
***Spondias mombin* L.** 2
***Sterculia striata* A.St.-Hil. & Naud.** 11
Strychnos pseudoquina A.St.-Hil. 39
Stryphnodendron adstringens (Mart.) Cov. 43
S. coriaceum Benth. 2
S. obovatum Benth. 4
S. polyphyllum Benth. 3
Styrax camporum Pohl 30
S. ferrugineus Nees & Mart. 33
Swartzia laurifolia Benth. 2
Syagrus comosa (Mart.) Mart. 16
S. flexuosa (Mart.) Becc. 16
Symplocos guianensis Gürke 2
S. lanceolata (Mart.) A.DC. 3
S. nitens (Pohl) Benth. 3
Symplocos rhamnifolia A.DC. 4

Tabebuia aurea Benth. & Hook. (=*T. caraiba* Bureau) 55
***T. impetiginosa* (Mart.) Standl.** (=*T. avellanedae* Lorentz ex Griseb.) 9
T. ochracea (Cham.) Standl. 58
***T. roseoalba* (Ridley) Sandw.** (=*T. odontodiscus* (Bur. & K.Schum.) Toledo) 6
Tapirira guianensis Aubl. 42
Tapura amazonica Poepp. & Endl. 2
***Terminalia argentea* Mart. & Zucc.** 37
T. brasiliensis Eichler 18
T. fagifolia Mart. & Zucc. 12
Tetragastris unifoliolata (Engl.) Cuatrec. 2
Tocoyena brasiliensis Mart. 5
T. formosa (Cham. & Schltdl.) Schum. 57
Triplaris americana R.H.Schomb. 3

Unonopsis lindmannii R.E.Fr. 2

Vanillosmopsis erythropappa (DC.) Sch. Bip. 3
V. pohlii Baker 2

V. polycephala (DC.) Sch. Bip. 6
Vatairea macrocarpa (Benth.) Ducke 40
Vellozia squamata Pohl 6
Vernonia ferruginea Less. 21
V. rubriramea Mart. 2
V. ruficoma Schltdl. ex Mart. 5
Virola sebifera Aubl. 28
V. subsessilis Warb. 2
Vismia cayennensis (Jacq.) Pers. 4
Vitex cymosa Bert. ex Spreng. 4
***V. polygama* Cham.** 7
Vochysia cinnamomea Pohl 7
V. elliptica (C.K.Spreng.) Mart. 25
V. haenkeana Mart. 10
V. rufa (C.K.Spreng.) Mart. 33
V. thyrsoidea Pohl 18
V. tucanorum (C.K.Spreng.) Mart. 17

Weigeltia densiflora Mez (= *Cybianthus densiflorus* Miq.) 2

***Ximenia americana* L.** 4
Xylopia aromatica Lam. 56
X. brasiliensis Spr. 2
X. sericea A.St.-Hil. 15

Zeyheria montana Mart. 36

APPENDIX 2

Species recorded at only one site and therefore excluded from analyses. Those indicating richer (mesotrophic) soils are in bold.

Abuta selloana Eichler
Acanthococos emensis Toledo
Aegiphila amazonica Moldenke
A. sellowiana Cham.
Alchornea discolor Poepp.
A. schomburgkii Klotzsch
***Amburana cearensis* (Allem.) A.C.Sm.**
Annona tomentosa R.E. Fr.
Apuleia leiocarpa J.Macbr.
Aspidosperma camporum Müll.Arg.
A. cylindrocarpum Müll.Arg.
A. populifolium A.DC.
A. pyrifolium Mart.
Attalea exigua Drude
***A. phalerata* Mart.**

Baccharis concinna G.M.Barosso
B. pseudotenuifolia (L.) Teodoro
Barbacenia ignea Mart.
Bauhinia mollis D.Dietr.
B. obtusata Vogel
Bocageopsis multiflora (Mart.) R.E.Fries
Butia paraguayensis (Barb. Rodr.) L.H.Bailey
Byrsonima clausenniana A.Juss.
B. inodora S.Moore
B. leucophlebia Griseb.
B. linguifera Nied.
B. psilandra Griseb.
B. vacciniaefolia A.Juss.

Callisthene microphylla Warm.
C. minor Mart.
Casearia commersoniana Cambess.
Cassia speciosa Kunth
Cecropia concolor Willd.
C. cyrtostachya Miq.
***Ceiba speciosa* (A.St.-Hil.) Gibbs & Semir**
Celtis pubescens (Kunth) Spreng.
Chaunochiton kappleri Ducke
Chomelia parviflora Müll.Arg.
Clethra brasiliensis Cham.& Schltdl.
Clusia sellowii Schltdl.
Combretum discolor Taub.
Commiphora leptophloeos (Mart.) J.B.Gillett (= *Bursera leptophloeos* Mart.)
Connarus perottetii (DC.)Planch. var. *angustifolium* Radlk.
Cordia bicolor DC.
C. piauhiensis Fresen.
Coutarea hexandra K.Schum.
Cupania rubiginosa (Poir.) Radlk.

Dalbergia glandulosa Benth.
Duguetia lanceolata A.St.-Hil.
Eremanthus argenteus Macleish & Schmach.
Erythroxylum pelleterianum A.St.-Hil.
Eschweilera nana (Berg) Miers
Esenbeckia febrifuga A.Juss.
Eugenia cerasiflora Kurz
E. chrysantha Berg
E. daphnites Mart.
E. hyemalis Cambess.
E. livida Berg
E. mugiensis Berg
E. polyphylla Berg
Eupatorium vautherianum DC.

Ficus guianensis Aubl.

Gochnatia polymorpha DC.
Guarea paniculata Wall.
Guapira opposita (Vell.) Reitz
Guatteria coriacea R.E.Fr.
G. nigrescens Mart.
G. silvatica R.E.Fr.

Hirtella racemosa Lam.

Ilex affinis Gardn.

Kielmeyera petiolaris Mart.

Lacistema serrulata Mart.
Lafoensia punicaefolia DC.
Leandra solenifera Cogn.
Licania blackii Prance
L. minutiflora (Sagot) Prance
Lithraea aroeirinha E.J.Marchal ex Warm.

Mabea pohliana Müll.Arg.
M. riedelii Müll.Arg.
Machaerium hirtum (Vell.) Stellfeld
M. lanatum Tul.
M. stipitatum Vog.
Manihot grandiflora Müll.Arg.
Maytenus alaternoides Reissek
M. communis Reissek
Miconia argentea DC.
M. cuspidata Naud.
M. flavescens Cogn. ex Britton
M. ibaguensis Schltdl.
M. irwinii Wurdack
M. tiliaefolia Naud.
Mimosa adenophylla Taub.
Monnina martiana Klotzsch ex A.W.Benn.
Moutabea guianensis Aublet
Myrcia castrensis (Berg) P.Legrand
M. longipes Kiaersk.
M. nigro-punctata DC.
M. rhodeosepala Kiaersk.
M. rorida Kiaersk.
M. rufipes DC.
M. sphaerocarpa DC.
M. splendens (Sw.) DC.
Mysine leuconeura Mart.

Neea macrophylla Poepp. & Endl.
Norantea goyazensis Cambess.

Oenocarpus distichus Mart.
Ouratea cuspidata Engl.

Palicourea marcgravii A.St.-Hil.
Persea pyrifolia Nees & Mart. ex Nees
Pisonia ambigua Heimerl.
Plumeria velutina Müll.Arg.
Protium brasiliense Benth.
Prunus myrtifolia (L.) Urb.
P. sellowii Koehne
Psidium acutangulum DC.
P. aerugineum Berg
P. australe Cambess.
P. guianense Sw.
P. pohliana Berg
P. widgrenianum Berg
Psychotria involucrata Sw.
Pterogyne nitens Tul.

Randia armata DC.
R. densiflora Benth.
Remijia amazonica K.Schum.
Roupala tomentosa Pohl
Rudgea villosa Benth.

***Schinopsis brasiliensis* Engl.**
Schoepfia obliquifolia Turcz.
Schwartzia adamantina (Cambess.) Bedell
Simaba glabra Engl.
Simira hexandra (S. Moore) Steyerm.
Solanum jamaicense Mill.
S. subinerme Jacq.
Sorocea illicifolia Miq.
Strychnos brasiliensis Benth.
Styrax nervosum A.DC.
S. pallida A.DC.
Swartzia grandifolia Bong. ex Benth.
Symplocos pubescens Klotzsch ex Benth.
S. tenuifolia Brand
S. uniflora Bedd.

Talisia subalbens Radlk.
Tibouchina candolleana Cogn.
T. clidemioides Cogn.
Tococa formicaria Mart.
Toulicia tomentosa Radlk.
Trichilia elegans A.Juss.
T. weddelii C.DC.

Vernonia brasiliana (L.) Druce
V. cinerea Less.
Vismia amazonica Ewan
Vitex montividensis Cham.
V. schomburgkiana Schauer
Vochysia gardneri Warm.
V. pruinosa Pohl

Wunderlichia crulsiana Taub.
W. mirabilis Riedel ex Baker

A morphological and biogeographic study of the *Acosmium dasycarpum* complex (*Leguminosae: Papilionoideae, Sophoreae*)

S. G. M. Bridgewater[1] & C. H. Stirton[2]

Summary. A morphological and biogeographic study of the *Acosmium dasycarpum* (Vogel) Yakovlev complex suggests that it comprises a single taxon and that there is no justification for recognising subspecies *dasycarpum* and *glabratum* (Benth.) Yakovlev as separate entities.

Introduction

Acosmium Schott (*Sophoreae, Papilionoideae*) is a neotropical genus of c. 17 species (Yakovlev 1969) extending from southern Mexico to northern Argentina, though the majority of species are restricted to Brazil. *Acosmium dasycarpum* (Vogel) Yakovlev is a species restricted to central and north-eastern Brazil, and is common in cerrado (tree savanna) vegetation, varying widely in growth form from a small shrub to a tree. Field observations and examination of herbarium specimens suggest that there are two distinct morphological forms of *A. dasycarpum* that differ in the presence or absence of an indumentum on the lower surface of the leaves. The two forms were alluded to as possible varieties by Bentham (1865) but were given subspecific rank by Yakovlev (1969). Despite these treatments the taxonomic status of the two forms remains ambiguous.

Material and methods

97 herbarium specimens from the Royal Botanic Gardens Kew (K), Edinburgh (E), and the University of Brasília, Brazil (UB) were examined to discern the nature of all morphological variation within the *A. dasycarpum* complex and to highlight its distribution. A full list of specimens examined may be obtained from the authors. In addition, three field populations were visited in Brazil to assess the morphological variation within populations and to determine the effect of ageing on the persistence of the indumentum. The three sites visited were (1) Fazenda de Juca Norbeta, c. 18 km W of Doverlândia, Goiás (16°52'S, 52°20'W), (2) Fazenda Bandeirante, c. 45 km from Doverlândia on the road to Baliza, Goiás

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(16°30'S, 52°23'W), and (3) Fazenda Parida, 31.5 km from Alto Paraíso de Goiás on the road to Nova Roma (14°07'S, 47°13'W).

Acosmium dasycarpum (Vogel) Yakovlev in Notes Roy. Bot. Gard. Edinburgh 29: 351 (1970)

Leptolobium dasycarpum Vogel in Linnaea 11: 388 (1837). Type: *Sellow* s.n., Brazil, Minas Gerais. Without precise locality. (Lectotype GH, chosen by Mohlenbrock 1963; Isolectotypes K!; US).

Leptolobium dasycarpum forma α & β nom. inval. Tul. in Arch. Mus. Hist. Nat. 4: 118 (1844).

Leptolobium glabrifolium Tul. in Arch. Mus. Hist. Nat. 4: 119 (1844). Type: *Gardner* 1570, Brazil, Ceará (Lectotype P!, designated here). See "Notes and changes in synonymy".

Leptolobium lanceolatum Tul. in Arch. Mus. Hist. Nat. 4: 118 (1844). Described from Pará, Brazil. Type: not found, possibly in Lisbon.

Leptolobium tortum Mart. in Herb. Fl. Bras. no. 1151 (cat. autogr.). Nom. inval.

Thalesia Mart. in Herb. Fl. Bras. no. 1151 (cat. autogr.); Endl. Gen. no. 6751. Nom. inval.

Leptolobium tortuosum Mart. ex Benth. in J. Linn. Soc., Bot. 8: 262 (1865), pro syn., nom. inval.

Sweetia dasycarpa (Vogel) Benth. in J. Linn. Soc., Bot. 8: 262 (1865).

Sweetia glabrifolia (Tul.) Benth. in J. Linn. Soc., Bot. 8: 262 (1865).

Sweetia dasycarpa (Vogel) Benth. var. *glabrata* Benth. in Mart., Fl. Bras. 15, 2: 6 (1870). Type: *Glaziou* 12603, Rio de Janeiro (lectotype K!, chosen by Mohlenbrock 1963).

Sweetia dasycarpa (Vogel) Benth. var. *torta* Malme in Ark. Bot. 18, 17: 21 (1934). Sine descr., nom. inval.

Sweetia handroi Mohlenbr. in Webbia 17: 246 (1963). Type: *Handro* 445, Brazil, São Paulo, Mogi-Guassu (holotype MO!; isotypes SP).

Acosmium dasycarpum (Vogel) Yakovlev subsp. *dasycarpum* in Notes Roy. Bot. Gard. Edinburgh 29: 351 (1969).

Acosmium dasycarpum (Vogel) Yakovlev subsp. *glabratum* (Benth.) Yakovlev in Notes Roy. Bot. Gard. Edinburgh 29: 351 (1969).

Shrub or small tree to 6 m; bark grey to grey-brown, corky, sometimes fissured and flaky; slash sandy-brown; wood yellow-cream; twigs brown, lightly ridged, glabrous to densely pubescent, green, brown or grey, older twigs grey-brown, fissured longitudinally. Stipules narrow, to 5 mm long, sparsely to densely pubescent, caducous; leaves to 26 cm long with 2 – 3 pairs of leaflets, rachis glabrous to densely pubescent, green to red-brown, sometimes ridged; stipels to 3 mm long, hairy; leaflets opposite to subopposite, imparipinnate, dark to light green, the venation paler and raised on the lower surface, tertiary venation pattern random reticulate to semicraspedodromous, the older leaflets tending to become coriaceous, the upper surface glabrous to slightly pubescent, the lower surface glabrous to densely pubescent, the base rounded to slightly cordate, apex retuse;

leaf shape elliptic to narrowly ovate, symmetrical about the midvein. Panicles to 29 cm long, axes green to brown, ridged, lightly to densely pubescent, often with red-brown pearl glands clustered at flower axils and on short flower pedicels; inflorescence bracts narrow, inconspicuous, densely pubescent, to 4 mm; bracts to 4 mm, narrow, pubescent; bracteoles narrow, glabrous to sparsely pubescent, to 3 mm, frequently persistent; calyx to 7 mm, very pubescent, lobes 3 mm long, persistent; corolla cream-yellow, petals clawed, subequal, to 1 cm long, venation prominent, sometimes with sparse long hairs on blades, lobes 5 mm long, margin lightly crenulate; stamens 10, 1.5 cm long, filaments free, anthers orange-brown, dorsifixed, sometimes persistent; gynoecium, ovary to 5 mm long, densely sericeous and raised on a distinct stipe of up to 2 mm, style frequently curved in dried specimens, 3 mm long, ovules 1 – 4. Fruits laterally compressed indehiscent pods, rugose, to 8 cm long, acuminate at apex, 1 – 3 seeded, immature fruits green, mature fruits brown, glabrous to pubescent, stipe to 2 mm long.

DISTRIBUTION. Brazil, from São Paulo (S) to Piauí (N), Mato Grosso (W) and Bahia (E).

HABITAT. In cerrado *sensu lato* (including deciduous forest) and campo rupestre.

SELECTED SPECIMENS. BRAZIL. São Paulo, Mogí-Mirim (22°26'S, 46°57'W), 18 Nov. 1936, fl., *F. C. Hoehne & Gehrt* SP No. 36864 (K); Distrito Federal, Entre DF 6 e Córrego Fazendinha (15°46'S, 47°53'W), 11 Oct. 1983, fl., *Kirkbride* 5414 (K); Bahia, Serra Geral de Caitité, c. 9 km S of Brejinhos das Ametistas (14°19'S, 42°27'W), 12 April 1980, fr., *Harley et al* 21291 (K); Minas Gerais, Município de Lavras, Reserva Biológica do Poco Bonito, (c. 21°14'S, 44°59'W), 25 Feb. 1986, fr., *de Carvalho & Pereira* 2326 (K). Goiás, Nr. Padre Bernardo (15°30'S, 48°35'W), 19 July 1972, fl., *Ratter et al* 2428 (E, K). Mato Grosso, Município de Baliza, Fazenda Bandeirante c. 45 km from Doverlândia (16°30'S, 52°23'W), 6 Nov. 1994, fl., *Bridgewater* 237 (E, K). Piauí. 1841, fl., *Gardner* 2543 (K). Rio de Janeiro, 1883, fl., *A. Glaziou* 13724 (K). Ceará. 1839, fl., *Gardner* 1570(K).

VERNACULAR NAME. Amargozinho, amargosa (Portuguese).

NOTES AND CHANGES IN SYNONYMY

Examination of herbarium material revealed that, although the majority of specimens could be classified as one of the two distinct morphological forms recognised by Bentham (1865) and Yakovlev (1969), a number were distinctly intermediate, with the indumentum on the lower surface ranging from sparse to dense. Typical glabrous collections (subsp. *glabratum sensu* Yakovlev (1969)) include the lectotype of *Sweetia dasycarpa* var. *glabrifolia*, (*A. Glaziou* 12603) as well as *Irwin* 34629, *Philcox* 3517 & 3658, *Balick* 1599 and *Bridgewater* 237, whilst collections in which the underside of the leaflets are densely pubescent (subsp. *dasycarpum sensu* Yakovlev (1969)) include the type specimen (*Sellow* s.n.) as well as *Anderson* 6975, *Irwin et al.* 13433 & 8939, *Hatschbach* 54636, *Kirkbride* 4514 and *Bridgewater* 239. Intermediate specimens include *Burchell* 6424, *White* 2543, *Labouriau* 54, *Burchell* 6191, *Harley et al.* 11046, *Heringer* 17986, *Burchell* 8533-5, *Silva* 57725, *Prance* 59679 and *Gardner* 2543.

It therefore appears that the variation in the indumentum is continuous, and therefore not a satisfactory character for describing infraspecific taxa. No other morphological characters were found that could be used for infraspecific division.

An analysis of the distribution of *A. dasycarpum* revealed that it occurs throughout the cerrado vegetation type. A more detailed study of the distribution of the two putative subspecies was also undertaken and occurrence of intermediate forms recorded. It was found that there is no marked geographic separation of the subspecies. Intermediate forms were found to be widespread (Map 1) which further supports the conclusion that they do not merit subspecific recognition.

Observations made in the field indicate that the indumentum character is not dependent on the age or size of the individual. Although each of the three populations visited showed only one morphological form, thereby suggesting

MAP 1. Distribution of *Acosmium dasycarpum*

consistency within a population, data collected from herbaria show that both forms have been collected from the same vicinity, see for instance, *Hoehne & Gehrt* SP No. 36864 and *Handro* 823. It is not known whether the different forms exist within a single population.

The continuous nature of the indumentum character and the geographical coincidence of the two forms of *A. dasycarpum* both in the same region and within a population, and the absence of further differentiating characters, indicates that *A. dasycarpum* should not be segregated at the subspecific level.

For *Leptolobium glabrifolium* Tul., three sheets of the type *Gardner* 1570 (P) were examined. Mohlenbrock identified the three sheets of the collection to *Sweetia dasycarpa* var. *glabrata* (Vogel) Benth, but all were found to belong to *Leptolobium glabrifolium* as defined by Tulasne. The sheet with the hand-written label *Cassia sericea* Sw. is here designated the lectotype. The remaining two sheets are designated isolectotypes.

Leptolobium elegans Vogel (in Linnaea 11: 390, 1837) *Sellow* s.n., has been removed from the synonymy. A fragment of the probable isotype was examined (US!) and does not fall within the concept of *Acosmium dasycarpum* (Vogel) Yakovlev adopted here. The holotype (LE) was not examined. As a result of this, the following names have also been excluded:

Sweetia elegans (Vogel) Benth. l. c. 262, quoad syn.
Leptolobium elegans Vogel var. *parviflora* Vogel ex Mohlenbr. nomen nudum in Webbia 17, 2: 250 (1963).

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ENGLISH TRANSLATION OF PORTUGUESE FLORISTIC DATA PAPER
Espécies lenhosas da fitofisionomia cerrado sentido amplo em 170 localidades do bioma cerrado
2001. B. Herb. Ezechias Paulo Heringer, Brasília 7: 5 - 112

WOODY CERRADO FLORISTIC DATA FROM 170 SURVEYS

James Alexander Ratter[1] , Samuel Bridgewater[1] & José Felipe Ribeiro[2],

ABSTRACT

This work presents floristic data for 170 rapid floristic surveys conducted in cerrado (*sentido restrito*) in the states of Bahia, Ceará, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Piauí, Rondônia and Tocantins. In total the species list comprises 587 woody taxa listed by locality, 463 of which are determined to species level. For each species an estimate of abundance at each site is given using the DACFOR scale (dominant, abundant, common, frequent, occasional and rare). The most frequent species recorded (occurring in 49% or more surveys) were: *Qualea parviflora*, *Qualea grandiflora*, *Dimorphandra mollis*, *Casearia sylvestris*, *Bowdichia virgilioides*, *Connarus suberosus*, *Tabebuia aurea*, *Hymenaea stigonocarpa*, *Lafoensia pacari*, *Himatanthus obovatus*, *Byrsonima crassa*, *Curatella americana*, *Diospyros hispida*, *Davilla elliptica*, *Pouteria ramiflora*, *Vatairea macrocarpa*, *Astronium fraxinifolium*, *Kielmeyera coriacea*, *Sclerolobium aureum*, *Annona coriacea*, *Andira vermifuga*, *Brosimum gaudichaudii*, *Simarouba versicolor*, *Tocoyena formosa*, *Salvertia convallariodora*, *Ouratea hexasperma*, *Stryphnodendron obovatum*, *Eriotheca gracilipes*, *Acosmium dasycarpum*, *Tabebuia ochracea*, *Byrsonima coccolobifolia*, *Machaerium acutifolium*, *Erythoxylum suberosum*, *Plathymenia reticulata*, *Magonia pubescens*, *Xylopia aromatica*, *Caryocar brasiliense*, *Roupala montana*, *Aspidosperma tomentosum*. e *Pseudobombax longiflorum*.

Key words: Cerrado, floristics, biogeography

INTRODUCTION

An understanding of the species distribution patterns within the cerrado biome is essential if informed judgements are to be made on the conservation and management of this biome. The cerrado is a type of tree savanna characterised by scattered contorted trees and a continuous grassy layer (Ribeiro and Walter, 1998) and originally covered an area of approximately 2 million km² of Central Brazil. This equates to 22% of the total area of the country (Felfili and Silva, 1993). The cerrado topography is generally flat and the soils are well drained, nutrient poor and acid. The climate is tropical seasonal with distinct rainy and dry seasons. Mean annual rainfall is about 1500 mm whilst mean annual temperatures are 25ºC.

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Various studies have attempted to describe and define the cerrado, the first focused study being conducted in Lagoa Santa by Warming in 1892 (Warming, 1973 - translation). In 1963 Rizinni published the first preliminary checklist for the flora which was later augmented by Heringer et al. (1977). This later list suggested the presence of 774 woody cerrado species (trees and large shrubs) belonging to 261 genera. Recently, three studies have dramatically improved our knowledge on the diversity of the cerrado flora: (i) a detailed herbarium-based floristic survey conducted by Pereira et al. (1985) (which included herbaceous species) revealed the presence of 2,264 vascular species despite focusing only on the Distrito Federal; (ii) Castro (1994) lists 1,753 woody taxa for the cerrado *sentido restrito* (iii) a thorough revision using all the floristic data available at the time conducted by Mendonça et al. (1998) noted the presence of 6,671 taxa in the vascular flora of the biome, although this includes all vegetation forms including riverine forest.

The objective of this contribution is to make available floristic inventory data of the woody trees and shrubs found in 170 rapid survey conducted in cerrado *sentido restrito* across the cerrado biome. In particular these surveys focus an areas where there was little previous knowledge of the cerrado flora such as the states of Mato Grosso do Sul and Tocantins. All surveys were conducted as part of the '*Conservation and Management of the Biodiversity of the Cerrado Biome*' project, a collaborative initiative between EMBRAPA-Cerrados, the University of Brasília and the Royal Botanic Garden Edinburgh

METHODS

The data presented in this paper represent the result of field work conducted between 1996 and 2000 with surveys conducted in the states of Bahia, Ceará, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Piauí, Rondônia and Tocantins. The rapid surveys were undertaken in undisturbed localities of cerrado *sentido restrito* in areas where there was little or no prexisting floristic information according to the literature. The sampling of sites was aided by a grid of 1° latitude by 1°30 degrees longitude (Figure 1), with an attempt being made to conduct at least three surveys within each grid square where cerrado occurs.

The survey technique consisted of general collecting and 'wide patrolling' within the area, whereby all the woody species observed were registered. Small shrubs and hemixyles were excluded from the study. Three highly experienced field surveyors were involved in the study, all of whom had a long standing experience of working on the cerrado flora. Where species identifications were in doubt, collections were made for later determination.

In time intervals of 15 minutes, the number of species observed to that point was recorded, allowing the production of a time-species curve (Figure 3). The majority of surveys were

conducted in one hour, this time interval being sufficient to record at least 90% of all species present. However, in highly diverse areas, the time required to flatten the curve was occasionally up to two hours. On completion of each survey, the surveyors designated an abundance value for each species based on concensus.

RESULTS

A total of 576 woody taxa were recorded in the 170 floristic surveys, 456 of which were identified with certainty to species level. The majority of the species recorded were typical of cerrado *sensu restrito*, although a few species were 'rogues' and more typical of other vegetation formations e.g. *Buchenavia tetraphylla* (forest), *Calophyllum brasiliense* (forest), *Richeria grandis* (riverine forest) and *Symplocos nitens* (forest). Table 1 shows the location of each survey and the number of species recorded. Table 2 lists all of the woody species recorded in the surveys, together with an estimate of their abundance at each site. The 40 most frequent (and widely distributed) cerrado species are presented in Table 3. Table 4 provides and example of the type of data recorded for each survey.

DISCUSSION

The woody floristic list presented adds substantial new information on the distribution of cerrado species. In particular it provides the first detailed and widespread information for the cerrados of Mato Grosso do Sul, Tocantins and Rondônia. The rapid survey methods used have shown that, with an experienced team of specialists, it is possible in a short period of time to gain vital floristic information on the woody flora.

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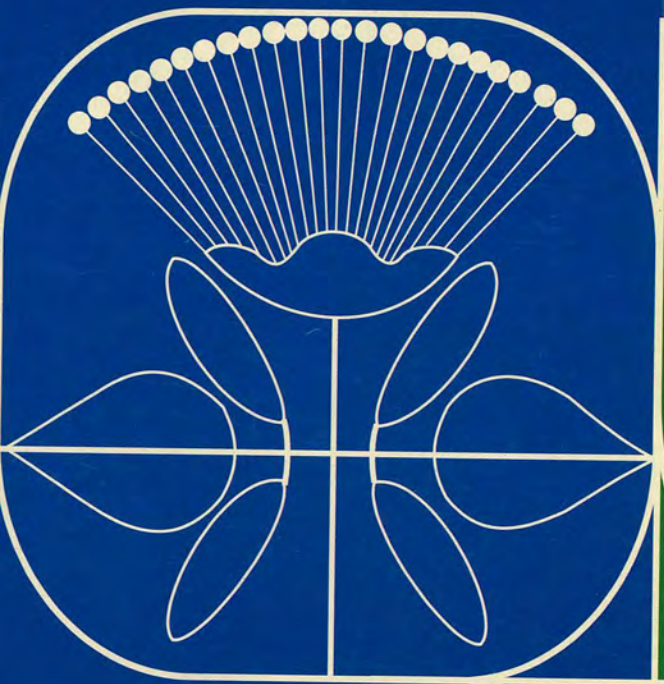

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580 - CDD 21

ESPÉCIES LENHOSAS DA FITOFISIONOMIA CERRADO SENTIDO AMPLO EM 170 LOCALIDADES DO BIOMA CERRADO

James Alexander Ratter[1]; Samuel Bridgewater[1]; José Felipe Ribeiro[2]

RESUMO – Este estudo apresenta 587 táxons, 463 determinados até o nível de espécies lenhosas, para a flora encontrada em 170 levantamentos florísticos rápidos em Cerrado sentido amplo, distribuídos nos Estados de Bahia, Ceará, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Piauí, Rondônia, e Tocantins. Para cada espécie encontrada, é fornecida uma estimativa da sua freqüência relativa. As espécies mais freqüentes (ocorrendo em 49% ou mais dos levantamentos) foram: *Qualea parviflora*, *Qualea grandiflora*, *Dimorphandra mollis*, *Casearia sylvestris*, *Bowdichia virgilioides*, *Connarus suberosus*, *Tabebuia aurea*, *Hymenaea stigonocarpa*, *Lafoensia pacari*, *Himatanthus obovatus*, *Byrsonima crassa*, *Curatella americana*, *Diospyros hispida*, *Davilla elliptica*, *Pouteria ramiflora*, *Vatairea macrocarpa*, *Astronium fraxinifolium*, *Kielmeyera coriacea*, *Sclerolobium aureum*, *Annona coriacea*, *Andira vermifuga*, *Brosimum gaudichaudii*, *Simarouba versicolor*, *Tocoyena formosa*, *Salvertia convallariodora*, *Ouratea hexasperma*, *Stryphnodendron obovatum*, *Eriotheca gracilipes*, *Acosmium dasycarpum*, *Tabebuia ochracea*, *Byrsonima coccolobifolia*, *Machaerium acutifolium*, *Erythoxylum suberosum*, *Plathymenia reticulata*, *Magonia pubescens*, *Xylopia aromatica*, *Caryocar brasiliense*, *Roupala montana*, *Aspidosperma tomentosum* e *Pseudobombax longiflorum*.

Termos para indexação: cerrado, florística, biogeografia.

ABSTRACT – This study lists 587 taxa, 463 identified to species level, regarding to the woody flora found in 170 rapid surveys performed in *Cerrado* of the Brazilian states of Bahia, Ceará, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Piauí, Rondônia, and Tocantins. Relative frequency is estimated for each species and the most frequent (occurring in 49% or more of the surveys) were: *Qualea parviflora*, *Qualea grandiflora*, *Dimorphandra mollis*, *Casearia sylvestris*, *Bowdichia virgilioides*, *Connarus suberosus*, *Tabebuia aurea*, *Hymenaea stigonocarpa*, *Lafoensia pacari*, *Himatanthus obovatus*, *Byrsonima crassa*,

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Curatella americana, *Diospyros hispida*, *Davilla elliptica*, *Pouteria ramiflora*, *Vatairea macrocarpa*, *Astronium fraxinifolium*, *Kielmeyera coriacea*, *Sclerolobium aureum*, *Annona coriacea*, *Andira vermifuga*, *Brosimum gaudichaudii*, *Simarouba versicolor*, *Tocoyena formosa*, *Salvertia convallariodora*, *Ouratea hexasperma*, *Stryphnodendron obovatum*, *Eriotheca gracilipes*, *Acosmium dasycarpum*, *Tabebuia ochracea*, *Byrsonima coccolobifolia*, *Machaerium acutifolium*, *Erythoxylum suberosum*, *Plathymenia reticulata*, *Magonia pubescens*, *Xylopia aromatica*, *Caryocar brasiliense*, *Roupala montana*, *Aspidosperma tomentosum* and *Pseudobombax longiflorum*.

Index terms: cerrado, floristics, biogeography.

INTRODUÇÃO

A caracterização da distribuição das espécies que ocorrem no Bioma Cerrado é muito importante para a conservação e o manejo das diferentes fitofisionomias desse bioma. As áreas originalmente cobertas pelo bioma Cerrado correspondem a aproximadamente 2 milhões de quilômetros quadrados, ou seja, 22% do território brasileiro (Felfili & Silva, 1993). O Cerrado é uma savana tropical típica, caracterizado por árvores tortuosas e esparsas, entremeadas por estrato graminoso bastante evidente (Ribeiro & Walter, 1998) em um relevo, em geral, suave ou suave-ondulado, com solos bem antigos, bem drenados, profundos e, na sua maioria, distróficos, ou seja, ácidos e de baixa fertilidade. O clima típico é o tropical estacional, com chuvas no verão e seca no inverno. A precipitação média anual é cerca de 1500 mm e as temperaturas médias são de 25 °C.

Vários estudos procuraram caracterizar a flora do Bioma, na tentativa de compilar sua composição florística. Os primeiros datam de 1892, provenientes do estudo de Warming em Lagoa Santa-MG (Warming, 1973). Em 1963, Rizzini publicou a lista-base dessa flora que foi ampliada por Heringer et al. em 1977, mostrando a existência de 774 espécies arbustivas e arbóreas, pertencentes a 261 gêneros. Recentemente, três estudos ampliaram ainda mais essa lista: (i) o levantamento de Pereira et al. (1985) (incluindo a vegetação rasteira e todas as fisionomias do Bioma), mostrou a existência de 2264 espécies vasculares, apesar de enfocar apenas o Distrito Federal; (ii) Castro (1994) listou 1753 táxons lenhosos para o Cerrado sentido restrito; e (iii) a revisão minuciosa de Mendonça et al. (1998) que somou 6671 táxons para a flora vascular de todas as fisionomias (inclusive mata, campo, etc.) do Bioma.

O objetivo deste estudo é tornar disponíveis as informações de ocorrência e freqüência de espécies arbóreas e arbustos grandes encontradas na fitofisionomia do Cerrado sentido restrito, em cada um dos 170 levantamentos florísticos rápidos realizados pelo projeto "Conservação e Manejo da Biodiversidade do Bioma Cerrado".

MATERIAL E MÉTODO

Este material é resultado do trabalho de campo realizado no período de 1996 a 2000, dentro das ações previstas no projeto de cooperação técnica "Conservação e Manejo da Biodiversidade do Bioma Cerrado", entre os governos Brasileiro e do Reino Unido (DFID). Os levantamentos foram realizados nos Estados da Bahia, Ceará, Goiás, Maranhão, Mato Grosso, Mato Grosso do Sul, Minas Gerais, Piauí, Rondônia e Tocantins.

O método de levantamento florístico rápido adotado foi aplicado em locais não ou pouco perturbados de Cerrado sentido amplo, selecionados em áreas pouco estudadas do Brasil de acordo com os levantamentos existentes na literatura. A seleção dessas áreas foi baseada na ausência de levantamentos na grade de 1°0' x 1°30' de latitude e longitude, respectivamente (Figura 1).

Considerou-se Cerrado sentido amplo aquele definido em Ribeiro & Walter (1998), designado como um dos tipos fitofisionômicos mais comuns que ocorrem no Bioma Cerrado, definido pela sua composição florística e pela fisionomia, considerando tanto a estrutura quanto as formas de crescimento dominantes. De fato, ele representa a vegetação lenhosa savânica do Bioma, abrangendo Cerrado Ralo (algumas vezes até Campo Sujo), Cerrado Denso e até Cerradão.

O levantamento florístico rápido consiste na varredura (*wide patrolling*) da área escolhida para registrar a ocorrência de qualquer espécie presente, seja árvore ou arbusto grande (mas também incluindo plantas jovens dessas espécies). Arbustos pequenos, com porções lenhosas de duração curta, oriundas de raízes perenes (geoxilas ou hemixilas), foram excluídos da amostragem. A aplicação desse método requer a presença de pelo menos três participantes, com larga experiência de campo no reconhecimento taxonômico de espécies lenhosas do Cerrado. O levantamento foi realizado com esse número de participantes, caminhando a uma distância de 10 e 20 metros entre si (Figura 2). Durante o tempo do levantamento, cada nova espécie encontrada para o local era comunicada ao participante anotador. Se no momento da varredura, fossem encontradas espécies desconhecidas ou de identificação duvidosa, o indivíduo era marcado e amostrado, sendo coletado mais tarde para posterior reconhecimento em herbário.

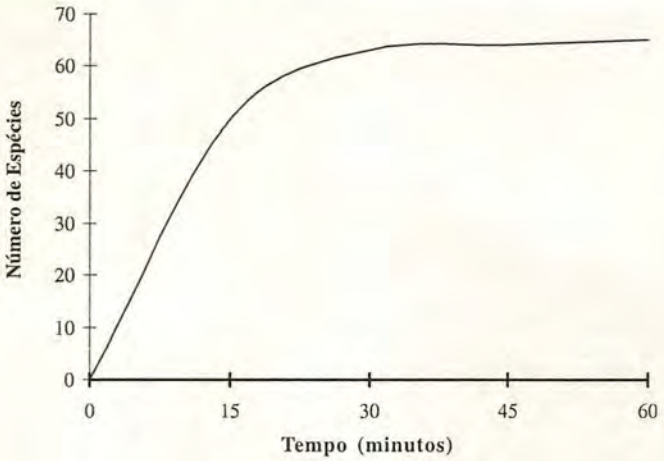

Figura 3. Curva espécie x tempo utilizada para estimar a representatividade dos levantamentos rápidos em cada um dos locais de amostragem. O exemplo mostra os resultados do levantamento realizado a 41 km a oeste de Água Clara na estrada para Campo Grande (BR 262), MS, (20°27'S 53°18'W) em 06/11/1996 (No. 81, MSAL, na Tabela 1).

RESULTADOS

Foram realizados 170 levantamentos, sendo reconhecidos 587 táxons, 463 até o nível de espécie, 83 até o gênero e 41 até a família. A grande maioria das espécies encontradas é típica do Cerrado sentido amplo, mas algumas são bem mais características de outras formações vegetais e ocorreram aqui como 'erráticas', entre as erráticas encontram-se *Buchenavia tetraphylla* (sin. *B. capitata*), *Calophyllum brasiliense*, *Cereus peruvianus*, *Platycyamus regnellii*, *Richeria grandis* e *Symplocos nitens*. A Tabela 1 apresenta a localização e o número de espécies encontradas em cada um dos levantamentos, e a Tabela 2 lista as espécies lenhosas em todos os levantamentos e sua respectiva abundância em cada local amostrado. Na Tabela 3, apresenta-se a lista com as 40 espécies com a maior ocorrência nos levantamentos, enquanto a Tabela 4 apresenta os dados de abundância da Figura 3, coletados no levantamento rápido, realizado a 41 km a oeste de Água Clara, na estrada para Campo Grande (BR 262), MS, (20°27'S 3°18'W), com informações sobre a localização, número de espécies, data da coleta e altitude.

Tabela 1. Código da localidade, cidade ou município, estado, localização e número de espécies encontradas de cada uma das 170 áreas onde foram realizados os levantamentos rápidos em Cerrado sentido amplo.

	Sigla	Cidade ou município	Coordenada	Nº de spp
1	BACO	Cocos, BA	14°01'S 44°27'W	54
2	BACC	Cocos, BA	14°05'S 44°30'W	55
3	BACS	Cocos, BA	14°49'S 45°58'W	54
4	BACR	Coribe, BA	13°52'S 44°27'W	54
5	BACE	Correntina, BA	13°23'S 44°41'W	55
6	BACT	Correntina, BA	13°23'S 44°35'W	55
7	BASA	Santa Maria da Vitória, BA	13°24'S 44°13'W	29
8	BARI	Riachão das Neves, BA	11°46'S 44°54'W	49
9	BASD	São Desidério, BA	12°19'S 44°59'W	51
10	BARR	Barreiras, BA	12°09'S 44°48'W	55
11	BARE	Barreiras, BA	12°09'S 44°37'W	43
12	BALE	Lençóis, BA	12°29'S 41°20'W	39
13	BALN	Lençóis, BA	12°26'S 41°30'W	42
14	BAJA	Jaborandi, BA	14°48'S 45°57'W	50
15	CECR	Crato, CE	07°17'S 39°29'W	44
16	GOIT	Itarumã, GO	18°55'S 51°27'W	75
17	GOIS	Israelândia, GO	16°19'S 50°59'W	74
18	GOIR	Israelândia, GO	16°14'S 50°47'W	79
19	GOIP	Iporá, GO	16°23'S 51°02'W	70
20	GOAP	Aparecida do Rio Claro, GO	15°52'S 51°04'W	68
21	GOFA	Fazenda Nova, GO	16°05'S 50°48'W	83
22	GOAV	Alvorada, GO	12°51'S 49°06'W	90
23	GOPO	Porangatu, GO	13°50'S 49°03'W	85
24	GOCO	Colinas do Sul, GO	14°26'S 48°08'W	74
25	GOCL	Niquelândia,GO	14°27'S 48°18'W	87
26	GOUR	Uruaçu, GO	14°33'S 49°09'W	90
27	GOUA	Uruaçu, GO	14°29'S 49°09'W	91
28	GOTE	Sta. Terezinha de Goiás, GO	14°22'S 49°31'W	84
29	GONO	Crixás, GO	14°24'S 50° 08'W	90
30	GONC	Nova Crixás, GO	14°16'S 50°15'W	80
31	GOSM	São Miguel do Araguaia, GO	13°16'S 49°58'W	86
32	GODE	Bandeirantes, GO	13°41'S 50°43'W	92

Continua ...

Tabela 1. Continuação.

	Sigla	Cidade ou município	Coordenada	Nº de spp
33	GOTG	Teresina do Goiás, GO	13°40'S 47°14'W	88
34	GOCB	Campos Belos, GO	13°16'S 46°57'W	71
35	MALR	Loreto, MA	07°23'S 45°01'W	42
36	MALT	Loreto, MA	07°20'S 45°04'W	20
37	MALE	Loreto, MA	07°22'S 45°06'W	52
38	MATO	Loreto, MA	07°21'S 45°05'W	40
39	MALO	Loreto, MA	07°02'S 45°09'W	50
40	MABA	Barão de Grajaú, MA	06°32'S 43°31'W	38
41	MASJ	São João dos Patos, MA	06°40'S 44°12'W	38
42	MAFO	Fortaleza dos Nogueiras, MA	06°50'S 46°10'W	79
43	MAFR	Fortaleza dos Nogueiras, MA	06°53'S 46°10'W	60
44	MAAL	Alto Parnaíba, MA	09°12'S 46°03'W	65
45	MAAT	Alto Parnaíba, MA	09°09'S 45°55'W	56
46	MAAP	Alto Parnaíba, MA	09°03'S 45°52'W	52
47	MATA	Tasso Fragoso, MA	08°26'S 45°48'W	60
48	MGSR	São Roque de Minas, MG	20°16'S 46°21'W	55
49	MGSM	São Roque de Minas, MG	20°22'S 46°11'W	33
50	MGJN	Januária, MG	15°32'S 44°36'W	48
51	MGPD	Pandeiros, MG	15°31'S 44°45'W	50
52	MGDE	Pandeiros, MG	15°29'S 44°40'W	44
53	MGFO	Formoso, MG	14°52'S 46°02'W	45
54	MGFR	Formoso, MG	14°52'S 46°02'W	63
55	MGFM	Formoso, MG	14°53'S 46°02'W	64
56	MGJO	São Joaquim, MG	15°29'S 45°10'W	63
57	MGAO	Arinos, MG	15°28'S 45°47'W	71
58	MGAS	Arinos, MG	15°55'S 46°09'W	58
59	MSCM	Campo Grande, MS	20°26'S 55°06'W	63
60	MSCP	Camapuã, MS	19°30'S 53°58'W	64
61	MSPU	Camapuã, MS	19°23'S 53°36'W	76
62	MSPA	Paraíso, MS	19°04'S 52°27'W	75
63	MSCO	Coxim, MS	18°30'S 54°42'W	70
64	MSSG	São Gabriel do Oeste, MS	19°31'S 54°27'W	69
65	MSAQ	Aquidauana, MS	20°23'S 56°04'W	51
66	MSAU	Aquidauana, MS	20°32'S 55°24'W	68

Continua...

Tabela 1. Continuação.

	Sigla	Cidade ou município	Coordenada	Nº de spp
67	MSAI	Aquiduana, MS	20°30'S 55°37'W	43
68	MSCI	Cipolândia, MS	20°00'S 55°20'W	65
69	MSBO	Bonito, MS	20°58'S 56°32'W	50
70	MSBN	Bonito, MS	20°50'S 56°37'W	57
71	MSBD	Bodoquena, MS	20°23'S 56°31'W	28
72	MSFE	Rio Caracol, MS	21°41'S 56°48'W	63
73	MSGU	Fazenda Água Amarela, MS	21°46'S 56°14'W	59
74	MSGL	Guia Lopes da Laguna, MS	21°24'S 56°01'W	59
75	MSPR	Paraíba, MS	19°20'S 51°20'W	68
76	MSIN	Inocência, MS	20°00'S 51°52'W	75
77	MSFR	Fazenda Renascença, MS	20°25'S 52°46'W	70
78	MSPO	Porto d' Areia, MS	20°53'S 51°40'W	56
79	MSSE	Serrinha, MS	20°37'S 52°15'W	52
80	MSTR	Três Lagoas, MS	20°40'S 52°08'W	63
81	MSAC	Água Clara, MS	20°27'S 52°52'W	53
82	MSAL	Água Clara, MS	20°27'S 53°18'W	65
83	MSAG	Água Clara, MS	20°27'S 52°58'W	60
84	MSRI	Ribas do Rio Pardo, MS	20°27'S 53°46'W	72
85	MSAN	Anhanduí, MS	20°49'S 54°29'W	74
86	MSSO	Auto Posto Piqui, MS	21°16'S 55°03'W	50
87	MSAP	Auto Posto Piqui, MS	21°05'S 54°57'W	39
88	MSND	Sidrolândia, MS	20°16'S 55°03'W	34
89	MSMA	Maracaju, MS	21°27'S 55°09'W	29
90	MTBA	Barra do Garças, MT	15°51'S 52°12'W	62
91	MTNV	Nova Xavantina, MT	14°44'S 52°40'W	72
92	MTNX	Nova Xavantina, MT	14°45'S 52°20'W	78
93	MTCA	Campinápolis, MT	14°16'S 52°43'W	51
94	MTCM	Campinápolis, MT	14°15'S 52°42'W	59
95	MTCP	Campinápolis, MT	14°20'S 52°47'W	41
96	MTRC	Riberão Cascalheira, MT	12°49'S 51°46'W	91
97	MTRI	Riberão Cascalheira, MT	13°05'S 52°00'W	66
98	MTRB	Riberão Cascalheira, MT	13°55'S 52°10'W	61
99	MTMC	Cocalinha, MT	14°40'S 51°20'W	52
100	MTAL	Alto Araguaia, MT	17°15'S 53°21'W	54

Continua...

Tabela 1. Continuação.

	Sigla	Cidade ou município	Coordenada	Nº de spp
101	MTTA	Tatuapé, MT	16°59'S 54°03'W	77
102	MTCN	Canarana, MT	13°31'S 52°28'W	106
103	MTCR	Canarana, MT	13°32'S 52°39'W	78
104	MTNA	Canarana, MT	13°41'S 52°04'W	85
105	MTGE	General Carneiro, MT	15°41'S 52°41'W	70
106	MTGC	General Carneiro, MT	15°46'S 52°31'W	60
107	MTDR	Comodoro, MT	13°30'S 59°50'W	56
108	MTCD	Comodoro, MT	13°50'S 59°45'W	59
109	MTCE	Cáceres, MT	16°15'S 57°40'W	64
110	MTCB	Cuiabá, MT	15°50'S 56°50'W	56
111	MTFC	Fazenda Campo Alegre, MT	15°28'S 55°00'W	61
112	MTPR	Primavera do Oeste, MT	15°37'S 54°00'W	69
113	PICO	Corrente, PI	10°28'S 45°10'W	30
114	PICR	Corrente, PI	10°05'S 45°15'W	36
115	PIGI	Gilbués, PI	09°44'S 45°23'W	55
116	PIGL	Gilbués, PI	09°17'S 45°35'W	41
117	PISA	Santa Filomena, PI	09°14'S 45°43'W	44
118	ROCA	Cacoal, RO	11°24'S 61°38'W	32
119	ROPI	Pimenta Bueno, RO	11°44'S 61°06'W	27
120	ROMI	Mini-Usina Site, RO	12°14'S 62°02'W	60
121	ROES	Espigão do Oeste, RO	11°41'S 60°37'W	55
122	ROQU	Querência, RO	12°10'S 61°20'W	42
123	ROPE	Pimenta Bueno, RO	11°43'S 61°09'W	36
124	ROPO	Pimenta Bueno, RO	11°36'S 61°13'W	27
125	ROPM	Faz. Cachoeira, RO	12°31'S 60°25'W	49
126	ROCO	Colorado do Oeste, RO	12°54'S 60°22'W	48
127	ROVI	Vilhena, RO	12°41'S 60°07'W	66
128	TOPC	Porto Nacional, TO	10°45'S 47°48'W	79
129	TOTE	Ponte Alta,TO	10°24'S 47°06'W	54
130	TOPT	Ponte Alta,TO	10°39'S 47°55'W	82
131	TOAP	Ponte Alta,TO	10°24'S 47°05'W	45
132	TONE	Ponte Alta,TO	10°27'S 47°10'W	30
133	TOLT	Ponte Alta,TO	10°30'S 47°11'W	24
134	TOON	Ponte Alta,TO	11°02'S 47°28'W	81

Continua...

Tabela 1. Continuação.

	Sigla	Cidade ou município	Coordenada	Nº de spp
135	TOFG	Figueirópolis, TO	12°14'S 49°15'W	75
136	TODA	Lajeado, TO	09°45'S 48°21'W	79
137	TOLJ	Lajeado, TO	09°38'S 48°23'W	63
138	TOPL	Palmas, TO	10°01'S 48°18'W	53
139	TOTA	Taquaras, TO	10°19'S 48°13'W	68
140	TOPO	Porto Nacional, TO	10°26'S 48°18'W	50
141	TOPN	Porto Nacional, TO	10°31'S 48°22'W	77
142	TOMO	Monte do Carmo, TO	10°48'S 48°05'W	86
143	TOMC	Monte Santo, TO	09°53'S 49°08'W	74
144	TOCA	Caseara, TO	09°53'S 49°53'W	60
145	TODI	Divinópolis, TO	09°48'S 49°36'W	35
146	TOLA	Lagoa da Confusão, TO	10°44'S 49°34'W	86
147	TOCR	Cristalândia, TO	10°35'S 49°10'W	54
148	TOPA	Paraíso do Tocantins, TO	10°05'S 48°56'W	74
149	TOBA	Barrolândia, TO	09°47'S 48°43'W	70
150	TOPU	Pugmil, TO	10°27'S 48°53'W	84
151	TONA	Natividade, TO	11°40'S 47°43'W	80
152	TONT	Natividade, TO	11°41'S 47°29'W	78
153	TONI	Natividade, TO	11°53'S 48°07'W	83
154	TOGU	Gurupi, TO	11°52'S 49°25'W	90
155	TOGR	Gurupi, TO	11°54'S 49°10'W	73
156	TOGP	Gurupi, TO	11°43'S 49°07'W	83
157	TOGI	Faz. Odara do Tocantins, TO	11°26'S 48°53'W	79
158	TORU	Faz. Odara do Tocantins, TO	11°28'S 48°53'W	82
159	TOPE	Peixe, TO	11°58'S 48°37'W	90
160	TOAL	Alvorada, TO	12°31'S 49°10'W	92
161	TOBO	Bom Jesus do Tocantins, TO	08°34'S 47°45'W	56
162	TOBJ	Bom Jesus do Tocantins, TO	08°43'S 47°44'W	81
163	TOBM	Bom Jesus do Tocantins, TO	08°50'S 45°52'W	98
164	TORO	Rio Sono, TO	09°25'S 47°37'W	95
165	TOSO	Rio Sono, TO	09°32'S 47°40'W	59
166	TORI	Rio Sono, TO	09°24'S 47°49'W	73
167	TOAR	Natividade, TO	11°49'S 47°29'W	80
168	TORR	Arraias, TO	12°39'S 47°06'W	80
169	TOAI	Arraias, TO	12°47'S 47°03'W	67
170	TOSA	Arraias, TO	12°53'S 47°00'W	91

Tabela 2. Espécies encontradas nos 170 levantamentos rápidos realizados em Cerrado sentido amplo no Bioma Cerrado. Para ajustar a tabela, os levantamentos para as 576 espécies encontram-se agrupados em blocos de aproximadamente 25 localidades.

Espécies	Código das Localidades																								
	BACO*	BACC*	BACR*	BACE*	BACT*	BASA*	BARI*	BASD*	BARR*	BARE*	BALE*	BALN*	BACS*	BAJA*	CECR*	MITRA*	GOIS*	GOIR*	GOIP*	GOAP*	GOFA*	GOAV*	GOPO*	GOCO*
Abarema cochliacarpos (Gomes) R.C. Barneby & J.W. Grimes												a												
Abuta grandifolia (Mart.) Sandw.																r								
A. selloana Eichler																								
Acacia paniculata Willd.																								
A plumosa Lowe																								
A. aff. polyphylla DC.																								
Acosmium dasycarpum (Vog.) Yakovlev		r	o			o	r	o	o				f	r	r		o	o		r	r	o	r	c
A. nitens (Vog.) Yakovlev																			o					
A. subelegans (Mohl.) Yakovlev																								
Acrocomia aculeata (Jacq.) Lodd. ex Mart.																	r	o	r	r	o			
Aegiphila lhotskyana Cham.										r		o	r		r	r								
Agonandra brasiliensis Miers	o	o	r	o	r								o				r	r	r	r		r		f
Aiouea trinervis Meissn.																								
Albizzia niopoides (Spruce ex Benth.) Burk.					r																			
Alchornea schomburgkii Klotzsch																								
Alibertia concolor (Cham.) K. Schum.															r									
A. edulis (L. Rich.) A. Rich.								o								r	f	o	r	o		r	f	o
A. elliptica (Cham.) K. Schum.		o	c		a		o		o						r									
A. obtusa Cham.							r											o		r	r		r	
A. sessilis (Cham.) K. Schum.													r											
A. verrucosa S. Moore																							r	
Alibertia sp. (R7844V)																								
Alibertia sp. (R7922)																								
Allophylus edulis Radlk. ex Warm.																								
Aloysia virgata Juss.																								
Amburana cearensis (Fr. Allem.) A.C.Sm.																								
Anacardium occidentale L.	f		f		c		c	o	f	r					c		r	o	r	o	r		o	r
Anadenanthera colubrina (Vell.) Brenan var. cebil (Griseb.) Altschul							o																	
A. peregrina (Benth.) Speg.																								
Andira cordata Arroyo ex R. T. Pennington				o					o				o	f										
A. cuiabensis Benth.																	r					o	f	f
A. vermifuga (Mart.) Benth.	f	f	o	o	f			o	o		r		f	r		r		r	f	r	o	o	f	f
Annona aurantiaca Barb. Rodr.																								
A. coriacea Mart.		r	r			r				r	a	a			o		r	f			c	r	o	f

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																						
	BACO'	BACC'	BACR'	BACE'	BACT'	BASA'	BARI'	BASD'	BARR'	BARE'	BALE'	BALN'	BACS'	BAJA'	CECR'	MTBA'	GOIS'	GOIR'	GOIP'	GOAP'	GOFA'	GOAV'	GOPO'	GOCO'
A. crassiflora Mart.	f	f	f	r	r									r										o
A. dioca A . St.-Hil.																								
A. tomentosa R.E. Fr.	o								o	o									f					
Annona sp. (R8012)		o	r	r	o			r																
Antonia ovata Pohl											r											r	r	
Apeiba tibourbou Aubl.																								
Apuleia leiocarpa J. Macbr.																					r			
Aspidosperma cylindrocarpum Müll. Arg.																								
A. macrocarpon Mart.	r	r	o	r	r	r												f	o	r	o			r
A. multiflorum A. DC.																								
A. nobile Müll. Arg.																	o	o			f	o	r	o
A. parvifolium A. DC.																								
A. subincanum Mart.																	r	r		o	r		r	
A. tomentosum Mart.	r	o	o	o		f				o			o	f		r	r	c	f		c	f	r	f
Astrocaryum aculeatum G. Mey																								
A. vulgare Mart.																								
Astronium fraxinifolium Schott	r	o	r		r	f	a										a	c	c	c	f	c	a	r
A. urundeuva Fr. Allem.							c										f	r	r	f	r	r	f	
Attalea humilis Mart.																								
A. phalerata Mart.																								
A. speciosa Mart. ex Spreng.																				r				
Austroplenckia populnea (Reissek) Lundell																			r					
Baccharis dracunculifolia DC.																								
Banisteriopsis latifolia (A. Juss.) Cuatrec.																							r	
Banisteriopsis sp. (S755)																								
Bauhinia bongardii Steud.																	a	a	r		f			
B. cupulata Benth.																								
B. dubia G. Don.																								
B. mollis Walp.																								
B. pulchella Benth.							a																	
B. rufa (Bong.) Steud.																	c			f				
B. ungulata L.																		o						
Bauhiniasp. (R7515V)																								
Bauhinia sp. (R7558)																								
Bauhinia sp. (R7559)																								
Bauhinia sp. (S759)																								
Blepharocalyx salicifolius (Kunth) O. Berg																								
Borojoa lanceolata (Cham.) Cuatrec.																								
Bowdichia virgilioides Kunth	o	f	f	f				r	f	f	f	o	f	f	c	r	f		f	f	r	o	f	c
Bredemeyera brevifolia Klotzsch ex A.W. Benn.											r													
B. floribunda Willd.					o										r									

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	BACO*	BACC*	BACR*	BACE*	BACT*	BASA*	BARI*	BASD*	BARR*	BARE*	BALE*	BALN*	BACS*	BAJA*	CECR*	MTBA*	GOIS*	GOIR*	GOIP*	GOAI*	GOFA*	GOAV*	GOPO*	GOCO*
Brosimum gaudichaudii Trécul	r	r	r	r	o	o		o	o		f						o	o	o	o	o	r	f	o
Buchenavia tetraphylla (Aubl.)R.A.Howard											r													
B. tomentosa Eichler													r	r		o	r	f	c	o	c	o		
Butia leiospatha (Mart.) Becc.																								
Byrsonima basiloba A. Juss.													f	o		o	c	f	f		r	f	o	
B. coccolobifolia Kunth	o	r	o																					
B. correaefolia A. Juss.		r							o	o		f												
B. crassa Nied.		r	r	r	r	r	c	o	o	o					o	o	c	c	f	o	o	f	o	f
B. crassifolia (L.) Kunth																						r		
B. gardnerana A. Juss.																								
B. inodorum S. Moore																								
B. intermedia A. Juss.			r	o					r	r														
B. cf. oblongifolia A. Juss											f	c			a									
B. sericea DC.																								
B. sessilifolia Benth.																								
B. stipulacea Adr. Juss.																o								
B. vacciniaefolia A. Juss.																								
B. verbascifolia Rich. ex A. Juss.	r	r	r										f	o			o				r	o	o	o
Byrsonima sp. (R7742V)																								
Byrsonima sp. (R7756V)																								
Cabralea canjerana (Vell.) Mart.																								
Caesalpinia bracteosa Tul.																								
Callisthene fasciculata (Spreng.) Mart.							a										a		f	a	r			
C. cf. *hassleri* Briq.																								
C. major Mart.																	o		o		r			
C. minor(Mart)																								
Callisthene cf. *mollissima* Warm.																						a		
Calophyllum brasiliense Cambess.																								
Calotropis procera Dryend.																								
Calycophyllum multiflorum Griseb.																								
Campomanesia eugenioides Blume																								
C. cf. *xanthocarpa* O. Berg																								
*Caraipa densiflora*Mart.																								
Cardiopetalum calophyllum Schltdl.																								
Cariniana domestica Miers																								
C. rubra Miers																								
Caryocar brasiliense Cambess.	c	c	o		f	f			f				c	f			o		f		o	o	r	o
C. coriaceum Wittm.				c				o	f						a									
Casearia arborea Urb.																								
C. grandiflora Cambess.												f			a									
C. javitensis Kunth																								
C. rupestris Eichler																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	BACO'	BACC'	BACR'	BACE'	BACT'	BASA'	BARI'	BASD'	BARR'	BARE'	BALE'	BALN'	BACS'	BAJA'	CECR'	MTBA'	GOIS'	GOIR'	GOIP'	GOAP'	GOFA'	GOAV'	GOPO'	GOCO'
C. sylvestris Sw.					o	o	r	r	o	o	f		o			o		o	r		r	o	o	a
Cecropia cyrtostachya Miq.																								
C. pachystachya Trécul																		r				r	o	r
Cedrella fissilis Vell.																							r	
Ceiba speciosa (A.St.-Hil.) Gibbs & Semir																								
Celtis pubescens (Kunth) Spreng.																								
Celtis sp. (R7548)																								
Cenostigma macrophyllum Tul.				c																				
Cenostigma sp. (S552)																	r							
Cereus jamacaru DC.																								
Chaetocarpus echinocarpus (Baill.) Ducke																								
Chamaecrista orbiculata (Benth.) Irwin & Barneby																								f
Cheiloclinium cognatum (Miers) A. C. Sm.																								
Chiococcoa alba Hitchc.																								
Chomelia obtusa Cham. & Schltdl.	r																							
C. pohliana Müll. Arg.																		f						r
C. ribesioides Benth.																								
Chrysophyllum arenarium Fr. Allem																								
C. marginatum Radlk.																								
C. rufum Mart.												f												
Chrysophyllum sp. (S554)																	r							
*Chrysophylum*sp. (R7614)																								
Clusia sellowii Schltdl.											r	o												
Coccoloba brasiliensis Nees & Mart.																								
C. mollis Casar.																			r	o		r		
Cochlospermum orinocense Steud.																								
C. regium (Schrank) Pilg.																								
C. vitifolium (Willd.) Spreng.							r					r										r		
Combretum duarteanum Cambess.																								
C. mellifluum Eich.	f	o	c	o		r	r		o	f	f		r											
Connarus suberosus Planch.	a	c	c	c	f	f		o	a	r			c	f		o	o	o	o		f	f	f	r
Copaifera langsdorfii Desf.		o					r				o					r				f		r		r
C. martii Hayne	f	o	o	a	a		r	c	c	c		r												
Cordia alliodora (Ruiz & Pav.) Oken																						r	o	
C. anabaptista Cham.																								
C. glabrata (Mart.) A. DC.							a																	
C. insignis Cham.																								
C. sellowiana Cham.																								r
C. trichotoma (Vell.) Arrab.																				f				
Cordia sp. (R7973V)																								
Couepia grandiflora (Mart. & Zucc.) Benth.	f		r	o	r			o					o	r		f	r					f		

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	BACO*	BACC*	BACR*	BACE*	BACT*	BASA*	BARI*	BASD*	BARR*	BARE*	BALE*	BALN*	BACS*	BAJA*	CECR*	MTBA*	GOIS*	GOIR*	GOIP*	GOAP*	GOFA*	GOAV*	GOPO*	GOCO*
Coussarea hydrangeaefolia Benth. & Hook.								c											o	o	o	r		
Croton urucurana Baill.																								
Croton sp. (R8122)												o												
Cupania rugosa Radlk.												o												
C. vernalis Cambess.																								
Curatella americana L.	r						f									c	a	a	c	c	c	f	a	a
Cybianthus detergens Mart.																								
Cybistax antisyphilitica Mart.		r			r			r										r						
*Dalbergia cuiabensis*Benth.																								
D. glandulosa Benth.																			r				r	
D. miscolobium Benth.								r	r	f	r	a							a				c	
Davilla elliptica A. St.-Hil.	c		f	c			r		r	o			o	o		c	f	f			o	f		c
Desmoncus orthocanthos Mart.																								
Didymopanax distractiflorum Harms															a									
D. gardnerianum Tul.							c																	o
D. macrocarpum (Cham. & Schltdl.) Seem.																								
D. morototoni Decne. & Planch.																								
D. vinosum (Cham. & Schltdl.) March.																								
Didymopanax sp. (S1092)																								
Didymopanax sp. (R8142V)																								
Didymopanax sp. (RS1004)																				f	r			
Dilodendron bipinnatum Radlk.							o																	
Dimorphandra mollis Benth.	o	o	o	f	f	o		f	f	f			f	o		f	r	o	o	r	o	o	o	o
Diospyros burchellii Hiern																								
D. hispida DC.	f	o			r			r	r	o			c	r	f	f			o		o	f	o	
Diospyros sericea DC.											r											r		o
Diospyros sp. (R7953V)																		o	o	c	o	r		o
Dipteryx alata Vogel																f								
Diptychandra aurantiaca (Mart.) Tul.																								
Doliocarpus dentatus (Aubl.) Standl. Ssp. Dentatus																								
Duguetia furfuracea (A. St.-Hil.) Benth. & Hook.	o	r		f	o					r		f	o	o	o	o								
D. glabriuscula R. E. Fries																								
D. lanceolata A. St.-Hil.																								
D. margraviana Mart.																								
Emmotum nitens (Benth.) Miers					r			r	o		c	a				o	r	o		f	o	r		r
Enterolobium contortisiliquum(Vell.)Morong																						r	r	
E. gummiferum (Mart.) J. Macbr.	r	r	r	r	r			o	o	o	f								r			o		f
Ephederanthus parviflorus S. Moore																								
Eremanthus glomerulatus Less.													o											
E. goyazensis Sch. Bip.																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	BACO	BACC	BACR	BACE	BACT	BASA	BARI	BASD	BARR	BARE	BALE	BALN	BACS	BAJA	CECR	MTBA	GOIS	GOIR	GOIP	GOAP	GOFA	GOAV	GOPO	GOCO
E. mattogrossensis Kuntze																								
E. rondoniensis MacLeish & Schumacher																								
Eriotheca gracilipes (Schum.) Robyns	o			r				r	o								r	f	r	r	o	r		
E. parvifolia (Mart. & Zucc.) A. Robyns																						r		
E. pubescens (Mart. & Zucc.) Schott. & Endl.	r															f								
Eriotheca sp. (R7863V)																								
Erythroxylum cf. anguifugum Mart.																								
E. betulaceum Mart.		r	r	r					o															
E. campestre A.St.-Hil.															r									
E. cuneifolium Poepp. ex O.E. Schulz																								
E. daphnites Mart.																				o	f		r	
E. deciduum A. St.-Hil.		r		r				r	r	o								f			f	o		
E. engleri O . E. Schulz																								
E. pruinosum O. E. Schulz																	r							
E. suberosum A. St.-Hil.							r			r		f	f	o		f	r				r	f	f	f
E. tortuosum Mart.																		o				o	r	
Erythroxylum sp. (S1006)																								
Erythroxylum sp. (R7600)																								
Erythroxylum sp. (R7870)																								
Erythroxylum sp. (R7870V)																								
Eschweilera nana (Berg) Miers																								
E. aurata O. Berg																							o	
E. biflora DC.																								
E. chrysantha O. Berg																								
E. dysenterica DC.		c	c	r	o	c	c	f	c								o	r		r		o	a	c
E. florida DC.																								
E. cf. gemmiflora O. Berg																								o
E. pumila Pohl																								
E. punicifolia (Kunth) DC.											o													
Eugenia sp. (R7873)																								
Eugenia sp. (R7944)																								
Eugenia sp. (R7959)																								
Eupatorium squalidum DC.																								
Euplassa inaequalis (Pohl) Engl.						f		r	o															
Ferdinandusa elliptica Pohl																r								
Genipa americana L.																								
Guapira opposita (Vell.) Reitz.																								
Guazuma ulmifolia Lam.																	r	r		r			r	
Guettarda viburnioides Cham. & Schltdl.																	o	o		f		a		
Hancornia. speciosa Gomez	r	r		r								r	r	r		o					r	o	r	r
Heisteria ovata Benth.	f	r	f	f	f	a	f	c	c	o			r											
Heisteria sp. (S553)																	r							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	BACO*	BACC*	BACR*	BACE*	BACT*	BASA*	BARI*	BASD*	BARR*	BARE*	BALE*	BALN*	BACS*	BAJA*	CECR*	MTBA*	GOIS*	GOIR*	GOIP*	GOAP*	GOFA*	GOAV*	GOPO*	GOCO*
Helicteres lhotskyana K. Schum.																		r						
Helicteres brevispira A. Juss.																		o	r		r	f	o	
H. macropelata A . Juss.							o																	
Heteropterys byrsonimifolia A. Juss.																								
Himatanthus articulatus (Vahl) Woodson																								
H. obovatus (Müll. Arg.) Woodson	r	r	r	f	o		o	r	o	o	f		o	r	f	o		o	f		o	o	o	o
H. sucuuba (Spruce ex Mull. Arg.) R.E. Woodson																								
Hirtella ciliata Mart. ex Zucc.				a	r						o	r		r	f									
H. burchellii Britton																								r
H. glandulosa Spreng.					o						o							r						
H. gracilipes (Hooker f.) Prance															c									
Hymenaea courbaril L. var. *stilbocarpa* (Hayne) Lee & Lang.																					r			
H. eriogyne Benth.																								
H. stigonocarpa Mart. ex Hayne	o	c	f	a	a	o	o	c	a		o	o	o	r	r	c	r		o		o	r	o	f
Hyptidendron canum (Pohl ex Benth.) Harley												r												
Inga cf. *affinis* DC.																								
I. alba Willd.																								
Inga sp. (R7550)							r										r			f	c	r		
Jacaranda brasiliana Pers.																								
J. caroba (Vell.) DC.																	o		r	o				
J. cuspidifolia Mart.																								
J. macrantha Cham.																								
J. rufa Silva Manso												r										f	o	
Jatropha vitifolia Mill.	c	r	o	r			r	r	r	r	f	r	c	o		f	r	o	o	o	o	o	o	r
Kielmeyera coriacea (Spreng.) Mart.			f	f					r				o	r										
K. lathrophyton Saddi																o	o		o	r	r			r
K. rubriflora A. St.-Hil.																f								
K. speciosa A. St.-Hil.																								
Kielmeyera sp. (R7954)																f								
Lacistema aggregatum (Berg) Rusby																								
L. gardneri Kuntze			r	r	r		r	r	f				r	r	o	c		r	o	r	r	o		
Laoensia pacari A. St.-Hil.																								
Licania gardneri Kuntze																								
L. humilis Cham. & Schltdl.																								
L. octandra (Hoffm. ex Roem & Schult.) Kuntze																								
L. sclerophylla Mart.ex Hook.f.																								
*Licania*sp. (S1082)																								
Licania sp. (R7601)																				r				
Linociera hassleriana (Chodat) Hassler																								
Lithraea molleoides (Vell.) Engl.																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																						
	BACO	BACC	BACR	BACE	BACT	BASA	BARI	BASD	BARR	BARE	BALE	BALN	BACS	BAJA	CECR	MTBA	GOIS	GOIR	GOIP	GOAP	GOFA	GOAV	GOPO	GOCO
Ludwigia nenosa (Poir.) Ham.																	a	c	o	a	o	f	f	r
Luehea candicans Mart.							r																	
L. grandiflora Mart.																								
L. paniculata Mart.																								
L. speciosa Willd.																								
Luetzelburgia auriculata (Allem.) Ducke									o		r													
L. praecox Harms.																	o	o	r	f	o	f	f	r
Mabea fistulifera Mart.																								
Macairea radula DC.																								
Machaerium aculeatum Raddi																								
M. acutifolium Vogel																								
M. angustifolium Mart. ex Benth.																								
M. hirtum (Vell.) Stellfeld	c	a	r		r	a	a	c	c				c									r	f	r
M. opacum Vogel							o																	
M. scleroxylon Tul.																								
Machaerium sp. (R8024Va)																								
Maclura tinctoria (L.) Don ex Steud.					r	f	a									o	a	f	c	a			o	
Magonia pubescens A. St.-Hil.								r	r	r	c	r		o	c							r	r	
Maprounea guianensis Aubl.																								
Martiodendron parviflorum Amshoff.																o		o		r	r			
Matayba guianensis Aubl.																								
M. illicifolius Mart. ex Reissek																								
Maytenus sp. (R7833)																a					f			
Mezilaurus crassiramea (Meissn.) Taub.																								
M. itauba (Meissn.) Taubert																								
Miconia albicans (Sw.) Triana	r				o							c			a	c			o					r
M. burchellii Triana																								
M. fallax DC.																								
M. ferruginata DC.																								o
*M. holosericea*Triana																								
M. macrothyrsa Benth.											o													c
M. pyrifolia Naud.																								
M. rubiginosa (Bonpl.) DC.																								
M. sellowiana Naud.																								
M. stenostachya DC.																								
Miconia sp. (R7806)																								
Miconia sp. (Sueli 244)																								
Miconia sp. (R8199)																								
Miconia sp. (S2231)																								
Miconia sp. (S2232)																								
Miconia sp. (S2258)																								
Mimosa clausennii Benth.																								r

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	BACO*	BACC*	BACR*	BACE*	BACI*	BASA*	BARI*	BASD*	BARR*	BARE*	BALE*	BALN*	BACS*	BAJA*	CECR*	MTBA*	GOIS*	GOIR*	GOIP*	GOAP*	GOFA*	GOAV*	GOPO*	GOCO*
M. exalbenses Barneby																								
M. hebecarpa Benth.																								
M. laticifera Rizzini & Mattos																								c
M. pteridifolia Benth.																								
M. sericantha Benth.								c																
Mimosa sp. (S552)																	r							
Mimosa sp. (R7635V)																								
Microplolis gardneriana (A . DC.) Pierre											o													
Mollia burchelliiSprague																								
Monnina martiana Klotzsch ex A. W. Benn.																								
Mouriri elliptica Mart.	r	r	o	f				o					f	r								o	r	
M. pusa Gardner			r	o				r		r								r	r					
Myrcia albo-tomentosa Cambess.																								
M. canescens O. Berg																f								r
M. camapuanensis N. J. E. Silveira																o								
M. decrescens O. Berg																								
M. gardneriana O. Berg																o								
M. lanuginosa O. Berg																								
M. cf. lasiopus DC.																								
M. lingua (O. Berg) Mattos																								
M. mutabilis O. Berg																								
M. pallens DC.																								
M. cf. regneliana O . Berg												o										f	o	
M. rorida Kiaersk.											f						r				r			
M. rostrata DC.		r	o		o																			
M. schottiana O. Berg																								
M. sellowiana O. Berg																o							r	
M. splendens (Sw.) DC.																	r							
M. cf. *stictosepala* Kiaersk.																								
M. tomentosa (Aubl.) DC.																								
M. uberavensis O. Berg																								
Myrcia sp. (R7695V)																								
Myrcia (R7516V)																								
*Myrcia*sp. (R8204)																								
Myrcia sp. (S2216)																								
Myrcia sp. (S2233)																								
Myrcia sp. (Sueli 241)																								
Myrcia sp. (Sueli 276)																								
Myrcia sp. (Sueli 275)																								
Myrcia sp. (R8239)																								
Myrcia sp. (R7874V)																								
Myrcia sp. (R7890)																								

Continua ...

Espécies	Código das Localidades																							
	BACO*	BACC*	BACR*	BACE*	BACT*	BASA*	BARI*	BASD*	BARR*	BARE*	BALE*	BALN*	BACS*	BAJA*	CECR*	MTBA*	GOIS*	GOIR*	GOIP*	GOAP*	GOFA*	GOAV*	GOPO*	GOCO*
Myrcia sp. (R7893)																								
Myrcia sp. (R8239)																								
Myrcia sp. (R8262V)																								
Myrcia sp. (S2211)																								
Myrcia sp. (S2213)																								
Myrcia sp. (S2248)																								
Myrcia sp. (R7890)																								
Myrcia sp. (R7944V)																								
Myrcia sp. (R7927V)																								
Myrcia sp. (R8159V)																								
Myrcia sp. (R8160)																								
Myrcia sp. (R8288)																								
Myrcia sp. (S2350)																								
Nectandra cf. *cuspidata* Nees & Mart.																								
Neea theifera Oerst.							r	r		f			f					o			r	o	r	r
Neea sp. (R7580)																								
Norantea adamantina Cambess.																								
N. goyazensis Cambess.																								
Ocotea minarum Nees Mez.																								
O. suaveolens Hassl.																								
Ocotea sp. (R7775)															c									
Ocotea sp. (R8283)																								
Ouratea castaneaefolia Engl.																		r		r		r		
O. floribunda Engl.																								
O. hexasperma (A. St.-Hil.) Benth.	o	r	r	r					o				c	f	o	o		f				o	f	o	o
O. speciabilis (Mart.) Endl.		r		f	r				o		o						r						r	r	r
Ouratea sp. (S2349)																									
Oxandra sessiliflora R.E. Fries																								
Palicourea rigida Kunth														r		o	o	f	o			f	r	o	o
Parkia platycephala Benth.							o	r		f					a										
Peltogyne confertiflora (Hayne) Benth.																									
Pera glabrata (Schott.) Baill.																									
Peritassa campestris (Cambess.) A . C.																									
Persea pyrifolia Nees & Mart. ex Nees																									
Physocallyma scaberrimum Pohl																	r	r				r		f	
Piper aduncum L.																									
Piptadenia gonoacantha (Mart.) Macbride																									
Pithecelobium moniliformis Benth.						c																			
Piptocarpha rotundifolia (Less.) Baker													r	r				r				r		f	r
Pisonia graciliflora Mart.																									r
P. noxia Netto var. *noxia*																		r							
P. noxia var.*psammophila* Mart. ex J. A.																				o	r				r

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	BACO	BACC	BACR	BACE	BACT	BASA	BARI	BASD	BARR	BARE	BALE	BALN	BACS	BAJA	CECR	MTBA	GOIS	GOIR	GOIP	GOAP	GOFA	GOAV	GOPO	GOCO
Schmidt.																								
Pisonia opposita (Vell.) Reitz.																								
Pisonia sp. (R7842)																								
Pisonia sp. (R8293V)																								
Plathymenia reticulata Benth.					r						f	r			o				o			r		
Platonia insignis Mart.																								
Platycyamus regnelli Benth.																								
Platypodium elegans Vogel																				a	f			
Playmiscium floribundum Vogel																								
Pouteria ramiflora (Mart.) Radlk.	a	c	f	o	o	r		r	r	r	o		a	o	r	f/c		r	r			r	o	f
P. torta (Mart.) Radlk.	a	a	a	a			r		r	r			a	c							r			
Protium heptaphyllum (Aubl.) E. K. Marchal											f	r							r	f	o	r	r	
P. ovatum Engl.	r	r	o										o	a										
Pseudobombax longiflorum (Mart. & Zucc.) Robyns							r									o	o	o	f	f	o	f		
P. marginatum (A. St.-Hil., A. Juss. & Cambess.) Robyns																								
P. tomentosum (Mart. & Zucc.) Robyns																	c	r	o	c		o		
Psidium cinereum Mart. ex DC.																								
P. guianense Sw.																								
P. myrsinoides O. Berg	r	f	f		r		o	o	o				f	r	o							f	f	a
P. pohliana O. Berg															c								r	
P. warmingianum Kiaersk.													f	r										
Psidium sp. (S1074)																								
Psidium sp. (R8096)																								
Pterodon polygalaeflora Benth.	o	f	o	o	o	r	r	o	o				r											
P. pubenscens Benth.																o						r	r	c
Qualea dichotoma (Mart.) Warm.											o													
Q. grandiflora Mart.	f	f	f		o	o	c	f	a				f	r		f	a	c	a	o	o	o	f	o
Q. multiflora Mart.																f	a	c	a	c	f		f	
Q. parviflora Mart.	r	r	o	c	f		c	a	c	o			a	o	f	c	a	f	a	o	o	a	o	a
Rapanea ferruginea Spreng.																								
R. guianensis Kuntze												o			o									

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	BACO*	BACC*	BACR*	BACE*	BACT*	BASA*	BARI*	BASD*	BARR*	BARE*	BALE*	BALN*	BACS*	BAJA*	CECR*	MTBA*	GOIS*	GOIR*	GOIP*	GOAP*	GOFA*	GOAV*	GOPO*	GOCO*
R. umbellata Mart.																								
Remijia amazonica K. Schum.																								
Rhamnidium elaeocarpum Reissek																	o	o		c		o	r	
Richeria grandis Vahl																								
Rollinia cf. *mucosa* (Jacq.) Baill.																								
R. silvatica A . St.-Hil.																								
Roupala montana Aubl.									r						r		r	o	o	o	o	o	r	
Rourea induta Planch.				o				f		c			r	r			r	o	c			c		o
Rudgea burchelliana Mull. Arg.																								
R. viburnioides (Cham.) Benth.																	o	o			r	r		
Salacia crassifolia (Mart.) Peyr.	r	o	o	o	o			f	f	c	f	r		f		c					r	a	o	o
S. elliptica G.Don																	r		r					
Salacia sp. (R7633V)																								
Salacia sp. (S2246)																								
Salvertia convallariodora A. St.-Hil.	o	f	r	o	o					o			o	o		f	o	r	o		r		r	r
Sapium longifolium (Müll. Arg.) Huber																								
S. cf. *obovatum* Klotzsch ex Mull. Arg.																								
S. cf. *petiolare* (Mull. Arg.) Huber																								
Sapium sp. (S1090)																								
Schinopsis brasiliensis Engl.																								
Schinus longifolius (Lindl.) Speg. var. paraguariensis (Hassler) Barkl.																								
Sclerolobium aureum (Tul.) Benth.	f	r		f	o											f	r	r	c	c		f		f
S. paniculatum Vogel		o			c			a	r	a	a	f	r	o		c	r				r			r
Sebastiana brasiliensis Spreng.																								
Senna macranthera (DC. ex Coll.) Irwin & Barneby																								
S. silvestris (Vell.) Irwin & Barneby																								
S. spectabilis (DC.) Irwin & Barneby																								
S. velutina (Vogel) H.S. Irwin & R.C. Barneby										o														
Simaba blanchetii Turcz.				f	o	o		f		r														
Simarouba versicolor A. St.-Hil.	o					o	o				a	a			f	o	o	o	r	o	o		r	
Simira rubescens (Bent.) Bremk. ex Steyemark																								
Siparuna guianensis Aubl.																								o
Siphoneugena densiflora O. Berg																								
Solanum crinitum Lam.																		r						
S. lycocarpum St. Hil.										r		r												
Solanum sp. (Rosanna 144)																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	BACO*	BACC*	BACR*	BACE*	BACT*	BASA*	BARI*	BASD*	BARR*	BARE*	BALE*	BALN*	BACS*	BAJA*	CECR*	MTBA*	GOIS*	GOIR*	GOIP*	GOAP*	GOFA*	GOAV*	GOPO*	GOCO*
Sorocea guilleminiana Gaudich.																								
Spiranthera odoratissima A . St-Hil.					f																			
Spondias mombin L.																				o				
Sterculia striata A. St.-Hil. & Naud.																					r		r	o
Strychnos pseudoquina A. St.-Hil.				r				r					o	r		r				r				f
Stryphnodendron adstringens (Mart.) Cov.														r										
S. coriaceum Benth.										a			r	r	r									
S. obovatum Benth.	o	o	r		r					c	a	o	f	r	f	o		o			r	o	r	
Styrax ambiguus Seubert																								
S. camporum Pohl															r									
S. ferrugineus Nees & Mart.																								
Swartzia sp.(S1032)																								
Syagrus comosa (Mart.) Mart.																	r				r			
S. flexuosa (Mart.) Becc.																f			r		r			
S. oleracea (Mart.) Becc.																								
Symplocos nitens (Pohl.) Benth.																								
Tabebuia aurea (Manso) Bentham & Hook.f. ex S. Moore		o		r	r		o	o	o					c	r			r	o	o	o	r	f	o
T. impetiginosa (Mart.) Standl.																						r	r	
T. ochracea (Cham.) Standl.	o	o	o	r				r	o	r	r		f	r	r	o	o	r	o			r	o	
T. roseoalba (Ridley) Sandw.																				f		r		
T. serratifolia (Vahl.) Nich.																					r			o
Tapirira guianensis Aubl.											c	c						r				r	r	
Tapura amazonica Poepp. & Endl.																			r	r	r			
Terminalia argentea Mart. & Zucc.																	a	c	r	o		c	o	
T. fagifolia Mart. & Zucc.		f	r	o	o	f	r	a	a	o			o	o	r									
T. glabrescens Mart.																			r	r				
T. phaeocarpa Eichl.																								
Tetragastis balsamifera (Swartz) O. K.																								
T. unifoliolata (Engl.) Cuatrec.																								
Tibouchina candolleana Cogn.																								
Tocoyena brasiliensis Mart.																								
T. formosa (Cham. & Schltdl.) Schum.	r	o		r	r					r			o	o	r	o	f	o	o	o	r	o	o	o
Tontelea brachypoda Miers																								
Toulicia crassifolia Radlk.				f	o	f		c	o															
T. tomentosa Radlk.																								
Trattinickia rhoifolia Willd.																				r				
Trema micrantha Blume																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	BACO'	BACC'	BACR'	BACE'	BACT'	BASA'	BARI'	BASD'	BARR'	BARE'	BALE'	BALN'	BACS'	BAJA'	CECR'	MTBA'	GOIS'	GOIR'	GOIP'	GOAP'	GOFA'	GOAV'	GOFO'	GOCO'
Trichilia catigua C. DC.																								
T. elegans A. Juss.																								
T. pallida Sw.																								
Unonopsis sp. (S2250)																								
Vanillosmopsis. pohlii Baker												o												
Vatairea macrocarpa (Benth.) Ducke	r	o	f	f	f	o	o	a	a						r	c	r	o	o	f	c	r	f	
Vellozia squamata Pohl																f/c								
Vernonia ferruginea Less.																		o		r			o	r
Virola sebifera Aubl.																		r						
V. subsessilis Warb.				a				c																
Vismia glaziovii Rouhl.																								
V. decipiens Cham. & Schltdl.																							r	
V. guianensis (Aubl.) Choisy															c									
Vismia sp. (S1072)												f												
Vismia sp. (R7843)																								
Vitex cymosa Bert.ex Spreng.																								
V. panshiniana Moldencke																								
V. polygama Cham.																								
V. regnelliana Moldencke																								
Vitex sp. (S1032)																								
Vochysia cinnamomea Pohl																								
V. elliptica (C. K. Spreng.) Mart.																								
V. gardneri Warm.	c		a	a	r			o	o	f		r	r	f										
V. haenkeana Mart.																								
V. rufa (C. K. Spreng.) Mart.	o												c	r		o			o		o	r		
V. thyrsoidea Pohl												r												
V. tucanorum (C.K. Spreng.) Mart.																								
Ximenia americana L.					f						r													
Xylopia aromatica Lam.																r		o	r		o	o	o	c
X. sericea A. St.-Hil.											c													
Xylosma cf. *benthamii* Triana & Planch,																								
Zanthoxylum caribaeum Lam.																								
Z. cinereum Lam.																								
Z. gardneri Engler															o									
*Z. rhoifolium*Lam.												f								r				
Z. riedelianum Engl.																	r	r					r	
Zeyheria montana Mart.	o		r		r	r	r		r	r							r					r	r	
Annonaceae sp. (R8202)																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																						
	BACO*	BACC*	BACR*	BACE*	BACT*	BASA*	BARI*	BASD*	BARR*	BARE*	BALE*	BALN*	BACS*	BAJA*	CECR*	MTBA*	GOIS*	GOIR*	GOIP*	GOAP*	GOFA*	GOAV*	GOPO*	GOCO*
Annonaceae sp. (R8222)																								
Chrysobalanaceae (R8289V)																								
Euphorbiaceae R7777															r									
Lauraceae sp. (R8072)																								
Lauraceae sp. (R8267)																								
Lauraceae sp. (R7677)																								
Lauraceae sp. (R8018)																								
Myrtaceae sp. (R7699)																					r			
Myrtaceae sp. (S2243)																								
Myrtaceae sp. (S2236)																								
Myurtaceae sp. (R8260)																								
Myrtaceae R7701																					r			
Myrtaceae S1127V																								
Myrtaceae S1126V																								
Myrtaceae S455																								
Myrtaceae Sueli 237																								
Myrtaceae Sueli 238																								
Myrtaceae Sueli 239																								
Myrtaceae sp. (R8226V)																								
Myrtaceae sp. (S2211)																								
Myrtaceae sp. (S2212)																								
Myrtaceae sp. (R8203)																								
Myrtaceae sp. (R8204)																								
Myrtaceae sp. (R8177V)																								
Myrtaceae sp. (R8178V)																								
Myrtaceae sp. (R8217)																								
Myrtaceae sp. (R8224)																								
Myrtaceae sp. (R8225)																								
Myrtaceae sp. (S2217)																								
Myrtaceae sp. (R8228)																								
Myrtaceae sp. (S2236)																								
Myrtaceae sp. (R8258V)																								
Myrtaceae sp. (R8276V)																								
Myrtaceae sp. (S2261)																								
Myrtaceae sp. (S2262)																								
Myrtaceae sp. (S2263)																								
Myrtaceae sp. (R7981A)																								
Myrtaceae sp. (R8017)																								
Myrtaceae sp. (R7847V)																								
Myrtaceae sp. (R7848V)																								

Continua ...

Tabela 2. Espécies encontradas nos 170 levantamentos rápidos realizados em Cerrado sentido amplo no Bioma Cerrado. Para ajustar a tabela, os levantamentos para as 576 espécies encontram-se agrupados em blocos de aproximadamente 25 localidades.

Espécies	Código das Localidades																												
	GOCL	GOUR	GOTE	GONO	GONC	GOSM	GODE	GOUA	GOCB	GOTG	MAAL	MAAT	MAAP	MATA	MALO	MALR	MALT	MALE	MATO	MABA	MASJ	MAFO	MAFR	MGSR	MGSM	MGJN			
Abarema cochliacarpos (Gomes)																								c					
R.C. Barneby & J.W. Grimes																													
Abuta grandifolia (Mart.) Sandw.																													
A. selloana Eichler																													
Acacia paniculata Willd.																													
A plumosa Lowe																													
A. aff. *polyphylla* DC.																								c					
Acosmium dasycarpum (Vog.) Yakovlev	o	o		o	r	r	r	o	o	r	r	r	c	o			o	r			r			o	r				
A. nitens (Vog.) Yakovlev																													
A. subelegans (Mohl.) Yakovlev																								c					
Acrocomia aculeata (Jacq.) Lodd. ex Mart.									r																				
Aegiphila lhotskyana Cham.	o					r		r			r											r		c	o				
Agonandra brasiliensis Miers	o	r	r	r	r				r	r	o	o	f	r	r			r			o		r						
Aiouea trinervis Meissn.																													
Albizzia niopoides (Spruce ex Benth.) Burk.																													
Alchornea schomburgkii Klotzsch																													
Alibertia concolor (Cham.) K. Schum.												r																	
A. edulis (L. Rich.) A. Rich.	r	r	r	o				a	o	r												f							
A. elliptica (Cham.) K. Schum.																							r						
A. obtusa Cham.		r	r					r	a	r							o							c		r			
A. sessilis (Cham.) K. Schum.																													
A. verrucosa S. Moore																													
Alibertia sp. (R7844V)																													
Alibertia sp. (R7922)																													
Allophylus edulis Radlk.ex Warm.																													
Aloysia virgata Juss.																													
Amburana cearensis (Fr. Allem.) A.C.Sm.																													
Anacardium occidentale L.	o	c	o	f		o				o	r	r		c	f	c		o		c	f	f	o						
Anadenanthera colubrina (Vell.) Brenan *var.* cebil (Griseb.) Altschul	f							r																					
A. peregrina (Benth.) Speg.																													
Andira cordata Arroyo ex R.T. Pennington																													
A. cuiabensis Benth.	o	c	o		r	r	r	o	r	o			f	r	r	r		o	r										
A. vermifuga (Mart.) Benth.	o	r				o					f	f	f	f	f	o		r	o	o	o	o					o		
Annona aurantiaca Barb. Rodr.																													
A. coriacea Mart.	r	o	o	o	r	f	o			o										r	r	o				o	o		
A. crassiflora Mart.								r			r	r	r	f	f											a	o		
A. dioca A . St.-Hil.																													

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																														
	GOCL	GOUR	GOTE	GONO	GONC	GOSM	GODE	GOUA	GOCB	GOTG	MAAL	MAAT	MAAP	MATA	MALO	MALR	MALT	MALE	MATO	MABA	MASJ	MAFO	MAFR	MGSR	MGSM	MGJN
A. tomentosa R.E. Fr.	r								r													r				o
Annona sp. (R8012)																					f					
Antonia ovata Pohl																						r				
Apeiba tibourbou Aubl.																										
Apuleia leiocarpa J. Macbr.																										
Aspidosperma cylindrocarpum Müll. Arg.																										
A. macrocarpon Mart.	r	o	r				r	o		r	r	r			r			r	r	r		r	r			
A. multiflorum A. DC.																										
A. nobile Müll. Arg.	o	r	f	o		o	o	o		f																
A. parvifolium A. DC.					o	c	c										o									
A. subincanum Mart.	f		o			o	o	r		o								o								
A. tomentosum Mart.	f	o	c	o	o	f	f	f	o	c		r		r											r	r
Astrocaryum aculeatum G. Mey																										
A. vulgare Mart.																										c
Astronium fraxinifolium Schott	a	r	a	a	c	c	a	c	c	a		o	r	r	r	r	c	r	r		r					o
A. urundeuva Fr. Allem.	f		o	r	r	r	r		r	o							c		r			r	r			
Attalea humilis Mart.																										
A. phalerata Mart.																										
A. speciosa Mart. ex Spreng.																										
Austroplenckia populnea (Reissek) Lundell																										
Baccharis dracunculifolia DC.																										
Banisteriopsis latifolia (A. Juss.) Cuatrec.	c	o	o							o																
Banisteriopsis sp. (S755)																										
Bauhinia bongardii Steud.					r		f																			
B. cupulata Benth.																										
B. dubia G. Don.																										
B. mollis Walp.																										
B. pulchella Benth.		o	o	o					a	o																
B. rufa (Bong.) Steud.			f	o	f	o				f																
B. ungulata L.																										
*Bauhinia*sp. (R7515V)																										
Bauhinia sp. (R7558)																										
Bauhinia sp. (R7559)																										
Bauhinia sp. (S759)																										
Blepharocalyx salicifolius (Kunth) O. Berg																										
Borojoa lanceolata (Cham.) Cuatrec.				r		r																				
Bowdichia virgilioides Kunth	f	c	c	c	c	a	a	f		c		o	r	r	r	r		o	o	o	r	r	o	o	c	
Bredemeyera brevifolia Klotzsch ex A.W. Benn.																										
B. floribunda Willd.			r		r			f		r					r											
Brosimum gaudichaudii Trécul	o	o	o	r	r	o	o	o	f	o												r	r	r		r
Buchenavia tetraphylla (Aubl.) R.A. Howard																										
B. tomentosa Eichler				r	r	r	o				r											r				o
Butia leiospatha (Mart.) Becc.																										
Byrsonima basiloba A. Juss.																										
B. coccolobifolia Kunth		c	r	r	o		o	r	f	r												r			o	
B. correaefolia A. Juss.																			o							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																												
	GOCL	GOUR	GOTE	GONO	GONC	GOSM	GODE	GOUA	GOCB	GOTG	MAAL	MAAT	MAAP	MATA	MALO	MALR	MALT	MALE	MATO	MABA	MASJ	MAFO	MAFR	MGSR	MGSM	MGJN
B. crassa Nied.		f	r		o	o	f		o	r	o			r	o		o	o		r	o	o	o				f
B. crassifolia (L.) Kunth																													
B. gardnerana A. Juss.																													
B. inodorum S. Moore																													
B. intermedia A. Juss.																													
B. cf. oblongifolia A. Juss											r													f				
B. sericea DC.													c																
B. sessilifolia Benth.																													
B. stipulacea Adr. Juss.																													
B. vacciniaefolia A. Juss.																													
B. verbascifolia Rich. ex A. Juss.		o	r	o			o	r		r														c	c			
Byrsonima sp. (R7742V)											r																		
Byrsonima sp. (R7756V)														r				o											
Cabralea canjerana (Vell.) Mart.																								a					
Caesalpinia bracteosa Tul.																	r												
Callisthene fasciculata (Spreng.) Mart.	r			f	f	r			c								a	r										c	
C. cf. *hassleri* Briq.																													
C. major Mart.			r					r		r														c					
C. minor(Mart)																													
Callisthene cf. *mollissima* Warm.							o		c																				
Calophyllum brasiliense Cambess.																													
Calotropis procera Dryend.																													
Calycophyllum multiflorum Griseb.																													
Campomanesia eugenioides Blume																													
C. cf. *xanthocarpa* O. Berg																													
*Caraipa densiflora*Mart.																													
Cardiopetalum calophyllum Schltdl.																													
Cariniana domestica Miers																													
C. rubra Miers																													
Caryocar brasiliense Cambess.	r	r	r	f		r	o		f	r														o	a		f		
C. coriaceum Wittm.											f	a	f	c	f	f		r	r	a	c	o							
Casearia arborea Urb.																													
C. grandiflora Cambess.								r												c	f								
C. javitensis Kunth																				f									
C. rupestris Eichler	r																												
C. sylvestris Sw.	c	o	r	o	o		o	o	f	r	o	o	o	f	f	r		f	c	r	o		o		o		f		
Cecropia cyrtostachya Miq.																													
C. pachystachya Trécul			r					r		r											r		r						
Cedrella fissilis Vell.																													
Ceiba speciosa (A.St.-Hil.) Gibbs & Semir																													
Celtis pubescens (Kunth) Spreng.																													
Celtis sp. (R7548)																													
Cenostigma macrophyllum Tul.																													
Cenostigma sp. (S552)																													
Cereus jamacaru DC.																													
Chaetocarpus echinocarpus (Baill.) Ducke																													
Chamaecrista orbiculata																													

Continua ...

Tabela 2. Continuação.

Espécies	GOCL'	GOUR'	GOTE'	GONO'	GONC'	GOSM'	GODE'	GOUA'	GOCB'	GOTG'	MAAL'	MAAT'	MAAP'	MATA'	MALO'	MALR'	MALT'	MALE'	MATO'	MABA'	MASJ'	MAFO'	MAFR'	MGSR'	MGSM'	MGJN'
(Benth.) Irwin & Barneby																										
Cheiloclinium cognatum (Miers) A. C. Sm.																						r				
Chiococcoa alba Hitchc.																										
Chomelia obtusa Cham. & Schltdl.									o								r									
C. pohliana Müll. Arg.	o	r				r		r																		
C. ribesioides Benth.		r	r							r																
Chrysophyllum arenarium Fr. Allem																				o						
C. marginatum Radlk.																										
C. rufum Mart.																										
Chrysophyllum sp. (S554)																										
*Chrysophylum*sp. (R7614)																										
Clusia sellowii Schltdl.																										
Coccoloba brasiliensis Nees & Mart.																										
C. mollis Casar.				o	f																					
Cochlospermum orinocense Steud.																										
C. regium (Schrank) Pilg.																	r		r							
C. vitifolium (Willd.) Spreng.			o	o	r	o				o	o	o														
Combretum duarteanum Cambess.																										
C. mellifluum Eich.													r		r	r			o	o			r			
Connarus suberosus Planch.	r	r	o	o	f	o	r	r	o	o	f		o	o	f	f			f		o	c	f			f
Copaifera langsdorfii Desf.			r	r				r	r	r					r				r				r			f
C. martii Hayne	o				r	r	o				o	o	o	r		r		o	r							
Cordia alliodora (Ruiz & Pav.) Oken																										
C. anabaptista Cham.																										
C. glabrata (Mart.) A. DC.			r	a	r	r		o	f	r																
C. insignis Cham.																										
C. sellowiana Cham.																										
C. trichotoma (Vell.) Arrab.																										
Cordia sp. (R7973V)																										
Couepia grandiflora (Mart. & Zucc.) Benth.		o	r	r	o		r			r						r									a	
Coussarea hydrangeaefolia Benth. & Hook.				o		f	r		o		o															
Croton urucurana Baill.																										
Croton sp. (R8122)																										
Cupania rugosa Radlk.																										
C. vernalis Cambess.																										
Curatella americana L.	c	f	f	f	f	f	c	o	c	f			o	o	o	o	f	r				o	o			c
Cybianthus detergens Mart.																										
Cybistax antisyphilitica Mart.		r		r			r					r			r			r						r		
*Dalbergia cuiabensis*Benth.			r	r	r	r	r			r																
D. glandulosa Benth.																										
D. miscolobium Benth.		r				r	r				r	r			r			r		r				a	o	
Davilla elliptica A. St.-Hil.	c	f	c	c	f	r		o	o	c	r	o	o	r		o			o			o				o
Desmoncus orthocanthos Mart.																										
Didymopanax distractiflorum Harms																										

Continua

Tabela 2. Continuação.

Espécies	Código das Localidades																												
	GOCL	GOUR	GOTE	GONO	GONC	GOSM	GODE	GOUA	GOCB	GOTG	MAAL	MAAT	MAAP	MATA	MALO	MALR	MALT	MALE	MATO	MABA	MASJ	MAFO	MAFR	MGSR	MGSM	MGJN
D. gardnerianum Tul.																				r	o			o				
D. macrocarpum (Cham. & Schltdl.) Seem.																													
D. morototoni Decne. & Planch.	r							o																					
D. vinosum (Cham. & Schltdl.) March.											o	o		f															
Didymopanax sp. (S1092)																													
Didymopanax sp. (R8142V)																													
Didymopanax sp. (RS1004)									r																				
Dilodendron bipinnatum Radlk.	a		r	o					r	r																			
Dimorphandra mollis Benth.	o	f	f	o		f	f	f		f	r	r	r	r	o	f		r				f		r	r	r			
Diospyros burchellii Hiern				o																									
D. hispida DC.		o	o	f	f	o	f		c	o	f	f	r	f		c		f	a	o	f	f	o						
Diospyros sericea DC.			r	r				r														f	f						
Diospyros sp. (R7953V)																													r
Dipteryx alata Vogel	r	r		o	o		o	a										r											
Diptychandra aurantiaca (Mart.) Tul.															r														
Doliocarpus dentatus (Aubl.) Standl. Ssp. Dentatus																													
Duguetia furfuracea (A. St.-Hil.) Benth. & Hook.																								f	e	r			
D. glabriuscula R. E. Fries																													
D. lanceolata A. St.-Hil.																													
D. margraviana Mart.																													
Emmotum nitens (Benth.) Miers	r	r	r		r	r	r	r		r	r	o	r	r								c	c						
Enterolobium contortisiliquum (Vell.) Morong																													
E. gummiferum (Mart.) J. Macbr.	o		r	r		r	r	r		r	r				r			r				r	r	c	o	r			
Ephederanthus parviflorus S. Moore																													
Eremanthus glomerulatus Less.																													
E. goyazensis Sch. Bip.																													
E. mattogrossensis Kuntze																													
E. rondoniensis MacLeish & Schumacher																													
Eriotheca gracilipes (Schum.) Robyns	o	r	o	r	o	r	o	r		o			r	r								r	r			r			
E. parvifolia (Mart. & Zucc.) A. Robyns							o																						
E. pubescens (Mart. & Zucc.) Schott. & Endl.																													
Eriotheca sp. (R7863V)																													
Erythroxylum cf. anguifugum Mart.				o																									
E. betulaceum Mart.																													r
E. campestre A.St.-Hil.		r																											
E. cuneifolium Poepp. ex O.E. Schulz																													
E. daphnites Mart.							r	r	r																				
E. deciduum A. St.-Hil.		r				r		r	f																				
E. engleri O . E. Schulz																													
E. pruinosum O. E. Schulz									o																				

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																													
	GOCL[a]	GOUR[a]	GOTE[a]	GONO[a]	GONC[a]	GOSM[a]	GODE[a]	GOUA[a]	GOCB[a]	GOTG[a]	MAAL[a]	MAAT[a]	MAAP[a]	MATA[a]	MALO[a]	MALR[a]	MALT[a]	MALE[a]	MATO[a]	MABA[a]	MASJ[a]	MAFO[a]	MAFR[a]	MGSR[a]	MGSM[a]	MGJN[a]
E. suberosum A. St.-Hil.	f		o	o	o	o	o	o	o	o								r						c	f	
E. tortuosum Mart.		r							o															o	r	r
Erythroxylum sp. (S1006)																										
Erythroxylum sp. (R7600)																										
Erythroxylum sp. (R7870)																										
Erythroxylum sp. (R7870V)																										
Eschweilera nana (Berg) Miers											f	r	o													
E. aurata O. Berg		o						r																		
E. biflora DC.								o																		
E. chrysantha O. Berg																										
E. dysenterica DC.		o	o	f		r	r	a	c	o				f	o	r		f	a	r		c				a
E. florida DC.							r																			
E. cf. *gemmiflora* O. Berg					r	o	o			o																
E. pumila Pohl																										
E. punicifolia (Kunth) DC.																										
Eugenia sp. (R7873)																										
Eugenia sp. (R7944)																										
Eugenia sp. (R7959)																										
Eupatorium squalidum DC.																										
Euplassa inaequalis (Pohl) Engl.					r			o													•					
Ferdinandusa elliptica Pohl	f	r				r	r				r	o		r									o			
Genipa americana L.								r																		
Guapira opposita (Vell.) Reitz.																										
Guazuma ulmifolia Lam.	r		r	r	o	r			r	r							o					r				
Guettarda viburnioides Cham. & Schltdl.	r			o	c	r			f										r			r				
Hancornia. speciosa Gomez	f	r		f		r	r	r					f	r						r						
Heisteria ovata Benth.																										
Heisteria sp. (S553)																										
Helicteres lhotskyana K. Schum.																										
Helicteres brevispira A. Juss.																										
H. macropelata A . Juss.							o																			
Heteropterys byrsonimifolia A. Juss.		c	c	o			r	r		c		o	r	r										r		
Himatanthus articulatus (Vahl) Woodson																										
H. obovatus (Müll. Arg.) Woodson	o			o	o	o	o	o	f		f	o	o	r	o	f		r	r	f	o	c	f			
H. sucuuba (Spruce ex Mull. Arg.) R.E. Woodson																										
Hirtella ciliata Mart. ex Zucc.											a	a	a	a	a	a		o	r			r	f			
H. burchellii Britton																										
H. glandulosa Spreng.	r	r					r															c	f			
H. gracilipes (Hooker f.) Prance															r											
Hymenaea courbaril L. var. *stilbocarpa* (Hayne) Lee & Lang.								r																		
H. eriogyne Benth.																										
H. stigonocarpa Mart. ex Hayne	o	f	f	f	o	r	r	f	o	f	o	c	r	o	o	o		o	f	o	o	r	o	c		c
Hyptidendron canum (Pohl ex Benth.) Harley																										
Inga cf. *affinis* DC.																										
I. alba Willd.																										

Continua

Tabela 2. Continuação.

Espécies	Código das Localidades																													
	GOCL*	GOUR*	GOTE*	GONO*	GONC*	GOSM*	GODE*	GOUA*	GOCB*	GOTG*	MAAL*	MAAT*	MAAP*	MATA*	MALO*	MALR*	MALT*	MALE*	MATO*	MABA*	MASJ*	MAFO*	MAFR*	MGSR*	MGSM*	MGJN*					
Inga sp. (R7550)																										r				
Jacaranda brasiliana Pers.	c			r	r	r	r		r								o								o					
J. caroba (Vell.) DC.																														
J. cuspidifolia Mart.																								r						
J. macrantha Cham.																														
J. rufa Silva Manso																														
Jatropha vitifolia Mill.		r		f		r	f																							
Kielmeyera coriacea (Spreng.) Mart.	o	o		o	o	o	o		o		r	o	o	o		o						r		o	o					
K. lathrophyton Saddi												o	r									r	r							
K. rubriflora A. St.-Hil.	f	o	r	r				r		r																				
K. speciosa A. St.-Hil.																														
Kielmeyera sp. (R7954)									r																					
Lacistema aggregatum (Berg) Rusby																														
L. gardneri Kuntze																														
Laoensia pacari A. St.-Hil.			o	o	o	r	o		o	o	f	f	r	c	f	c		o	f	f	f			o	o	r				
Licania gardneri Kuntze																														
L. humilis Cham. & Schltdl.																														
L. octandra (Hoffm. ex Roem & Schult.) Kuntze																														
L. sclerophylla Mart.ex Hook.f.					o	o	r																							
*Licania*sp. (S1082)																														
Licania sp. (R7601)																														
Linociera hassleriana (Chodat) Hassler																														
Lithraea molleoides (Vell.) Engl.																									r					
Ludwigia nenosa (Poir.) Ham.																														
Luehea candicans Mart.																														
L. grandiflora Mart.																										f				
L. paniculata Mart.	a		a	a	a	o	o	o	c	a							a	r	r											
L. speciosa Willd.																														
Lueizelburgia auriculata (Allem.) Ducke																														
L. praecox Harms.												r																		
Mabea fistulifera Mart.													c																	
Macairea radula DC.																														
Machaerium aculeatum Raddi																														
M. acutifolium Vogel	r	o	r	r	r	f	r	f	o	r	o			r				r	r			r		e						
M. angustifolium Mart. ex Benth.			r					o	r	r																				
M. hirtum (Vell.) Stellfeld																										c				
M. opacum Vogel	r	f	o			o	r	o	f	o																				
M. scleroxylon Tul.																														
Machaerium sp. (R8024Va)																														
Maclura tinctoria (L.) Don ex Steud.																														
Magonia pubescens A. St.-Hil.	f	r	c	f	o	o	o	c	f	c	f			r	r		f	o	o		r	r								
Maprounea guianensis Aubl.													r							f			r							
Martiodendron parviflorum Amshoff.																		r												
Matayba guianensis Aubl.			o			r	r	a		o												r		e						
M. illicifolius Mart. ex Reissek																														
Maytenus sp. (R7833)																														

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																											
	GOCL	GOUR	GOTE	GONO	GONC	GOSM	GODE	GOUA	GOCB	GOTG	MAAL	MAAT	MAAP	MATA	MALO	MALR	MALT	MALE	MATO	MABA	MASJ	MAFO	MAFR	MGSR	MGSM	MGJN
Mezilaurus crassiramea (Meissn.) Taub.																												
M. itauba (Meissn.) Taubert																												
Miconia albicans (Sw.) Triana		a						a			r	r	r	r							r	c		c	a		
M. burchellii Triana	r																											
M. fallax DC.																												
M. ferruginata DC.																						r	r					
*M. holosericea*Triana																												
M. macrothyrsa Benth.								r														r						
M. pyrifolia Naud.																												
M. rubiginosa (Bonpl.) DC.																							r					
M. sellowiana Naud.																								r				
M. stenostachya DC.														r														
Miconia sp. (R7806)																							f					
Miconia sp. (Sueli 244)																												
Miconia sp. (R8199)																												
Miconia sp. (S2231)																												
Miconia sp. (S2232)																												
Miconia sp. (S2258)																												
Mimosa clausennii Benth.		r		r																								
M. exalbenses Barneby																	r						f					
M. hebecarpa Benth.																												
M. laticifera Rizzini & Mattos																												
M. pteridifolia Benth.																												
M. sericantha Benth.																												
Mimosa sp. (S552)																												
Mimosa sp. (R7635V)																												
Micropholis gardneriana (A. DC.) Pierre																												
*Mollia burchelli*iSprague																												
Monnina martiana Klotzsch ex A. W. Benn.																												
Mouriri elliptica Mart.			f	o	o	f	f			f		a	a	c	r	c												
M. pusa Gardner				r			r				f	o	f		r	o		r				r	f					
Myrcia albo-tomentosa Cambess.									f														r					
M. canescens O. Berg	r							f																				
M. camapuanensis N. J. E. Silveira																												
M. decrescens O. Berg																												
M. gardneriana O.Berg																				r								
M. lanuginosa O.Berg							r																					
M. cf. lasiopus DC.																												
M. lingua (O. Berg) Mattos																												
M. mutabilis O. Berg								o																				
M. pallens DC.																								a				
M. cf. regneliana O. Berg																												

Continua

Tabela 2. Continuação.

Espécies	Código das Localidades																									
	GOCL	GOUR	GOTE	GONO	GONC	GOSM	GODE	GOUA	GOCB	GOTG	MAAL	MAAT	MAAP	MATA	MALO	MALR	MALT	MALE	MATO	MABA	MASJ	MAFO	MAFR	MGSR	MGSM	MGJN
M. rorida Kiaersk.		f																								
M. rostrata DC.				o	c	o				o														c		
M. schottiana O. Berg																										a
M. sellowiana O. Berg						o	o				o					f				r		r			
M. splendens (Sw.) DC.																										
M. cf. *stictosepala* Kiaersk.																										
M. tomentosa (Aubl.) DC.					r	o				o														r		
M. uberavensis O. Berg																										
Myrcia sp. (R7695V)																										
Myrcia (R7516V)																										
*Myrcia*sp. (R8204)																										
Myrcia sp. (S2216)																										
Myrcia sp. (S2233)																										
Myrcia sp. (Sueli 241)																										
Myrcia sp. (Sueli 276)																										
Myrcia sp. (Sueli 275)																										
Myrcia sp. (R8239)																										
Myrcia sp. (R7874V)																										
Myrcia sp. (R7890)																										
Myrcia sp. (R7893)																										
Myrcia sp. (R8239)																										
Myrcia sp. (R8262V)																										
Myrcia sp. (S2211)																										
Myrcia sp. (S2213)																										
Myrcia sp. (S2248)																										
Myrcia sp. (R7890)																										
Myrcia sp. (R7944V)																										
Myrcia sp. (R7927V)																										
Myrcia sp. (R8159V)																										
Myrcia sp. (R8160)																										
Myrcia sp. (R8288)																						r				
Myrcia sp. (S2350)																										
Nectandra cf. *cuspidata* Nees & Mart.																										
Neea theifera Oerst.	o	r	r	o	r	r		f	r	r													r			
Neea sp. (R7580)																										
Norantea adamantina Cambess.																										
N. goyazensis Cambess.																										
Ocotea minarum Nees Mez.																										
O. suaveolens Hassl.																										
Ocotea sp. (R7775)																										
Ocotea sp. (R8283)																										
Ouratea castaneaefolia Engl.					r	r		f			r													r		
O. floribunda Engl.																								r		
O. hexasperma (A.St.-Hil.) Benth.		o	f		o	f	o	r	r				r	r	r	o			o				f	o		r

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																													
	GOCL	GOUR	GOTE	GONO	GONC	GOSM	GODE	GOUA	GOCB	GOTG	MAAL	MAAT	MAAP	MATA	MALO	MALR	MALT	MALE	MATO	MABA	MASJ	MAFO	MAFR	MGSR	MGSM	MGJN				
S. spectabilis (DC.) Irwin & Barneby																										f				
S. velutina (Vogel) H.S. Irwin & R.C. Barneby																														
Simaba blanchetii Turcz.																														
Simarouba versicolor A.St.-Hil.	f	f	o	f	f			r	o	o	c	o	o	o	o	o		f	o	o	o	o	o			r				
Simira rubescens (Bent.) Bremk. ex Steyemark																														
Siparuna guianensis Aubl.	o							a			o			r		o						f	f		r				
Siphoneugena densiflora O.Berg																														
Solanum crinitum Lam.																														
S. lycocarpum St. Hil.																						o	r							
Solanum sp. (Rosanna 144)																														
Sorocea guilleminiana Gaudich.																														
Spiranthera odoratissima A. St-Hil.																														
Spondias mombin L.																														
Sterculia striata A. St.-Hil. & Naud.																			r											
Strychnos pseudoquina A.St.-Hil.	o	o	o		r	o				o	r							o					r							
Stryphnodendron adstringens (Mart.) Cov.		f																o												
S. coriaceum Benth.	o															c			o	f	a	c								
S. obovatum Benth.			a	r			o	o		a	o	f	c	c		c	o					c	c							
Styrax ambiguus Seubert																														
S. camporum Pohl	r																													
S. ferrugineus Nees & Mart.		f						r																o	r					
Swartzia sp.(S1032)																														
Syagrus comosa (Mart.) Mart.	r			r			r				o	f		r		f							o						
S. flexuosa (Mart.) Becc.	r						r				o			r																
S. oleracea (Mart.) Becc.																														
Symplocos nitens (Pohl.) Benth.																														
Tabebuia aurea (Manso) Bentham & Hook.f. ex S. Moore	o		o	o	o	r	o	r	o	o	o	r			r	r	c					r	r						
T. impetiginosa (Mart.) Standl.	f								r																					
T. ochracea (Cham.) Standl.	f	o		o	o	o	r	r	r		r	r	r	r	o	r		r			r			c	f	r				
T. roseoalba (Ridley) Sandw.																														
T. serratifolia (Vahl.) Nich.		r		r																										
Tapirira guianensis Aubl.							r	r														r	f		o					
Tapura amazonica Poepp.&Endl.			r																											
Terminalia argentea Mart. & Zucc.	a		c	a	a		o	r	c	c																f				
T. fagifolia Mart. & Zucc.											r	c	r	r	r	r			r	c	o	r	r							
T. glabrescens Mart.																														
T. phaeocarpa Eichl.																														

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																										
	GOCL	GOUR	GOTE	GONO	GONC	GOSM	GODE	GOUA	GOCB	GOTG	MAAL	MAAT	MAAP	MATA	MALO	MALR	MALT	MALE	MATO	MABA	MASJ	MAFO	MAFR	MGSR	MGSM	MGJN
Tetragastis balsamifera (Swartz) O. K.																											
T. unifoliolata (Engl.) Cuatrec.								r																			
Tibouchina candolleana Cogn.									r													r					
Tocoyena brasiliensis Mart.																											
T. formosa (Cham. & Schltdl.) Schum.	o	r	o	o	o	o	r		f	o	r	r		o	r			r			r	r	r		c		
Tontelea brachypoda Miers																											
Toulicia crassifolia Radlk.																											
T. tomentosa Radlk.																											
Trattinickia rhoifolia Willd.																											
Trema micrantha Blume																											
Trichilia catigua C. DC.																											
T. elegans A. Juss.																											
T. pallida Sw.																											
Unonopsis sp. (S2250)																											
Vanillosmopsis. pohlii Baker																											
Vatairea macrocarpa (Benth.) Ducke	o	r	f		f	o	a	o	o	f		r		o		o		o		c	r	f	o			o
Vellozia squamata Pohl	a						r						f														
Vernonia ferruginea Less.		r	o	o			r		r	o	r		r	r			o					o		c	c	o	
Virola sebifera Aubl.																								c			
V. subsessilis Warb.											r	r															
Vismia glaziovii Rouhl.																											
V. decipiens Cham. & Schltdl.																											
V. guianensis (Aubl.) Choisy																					c						
Vismia sp. (S1072)																											
Vismia sp. (R7843)																											
Vitex cymosa Bert.ex Spreng.																											
V. panshiniana Moldencke		r																									
V. polygama Cham.																											
V. regnelliana Moldencke																											
Vitex sp. (S1032)																											
Vochysia cinnamomea Pohl																										o	
V. elliptica (C. K. Spreng.) Mart.																											
V. gardneri Warm.											f	f	c	f	o	f							f				
V. haenkeana Mart.																						r	r				
V. rufa (C. K. Spreng.) Mart.	r	o		r	f		r	r																			
V. thyrsoidea Pohl				o																							
V. tucanorum (C.K. Spreng.) Mart.																											
Ximenia americana L.	o		r						r	r																	
Xylopia aromatica Lam.		f			r	r	r	a			r			r								c	f	a	a		
X. sericea A. St.-Hil.																											
Xylosma cf. *benthamii* Triana & Planch,																											

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																													
	GOCL	GOUR	GOTE	GONO	GONC	GOSM	GODE	GOUA	GOCB	GOTG	MAAL	MAAT	MAAP	MATA	MALO	MALR	MALT	MALE	MATO	MABA	MASJ	MAFO	MAFR	MGSR	MGSM	MGJN				
Zanthoxylum caribaeum Lam.																														
Z. cinereum Lam.																														
Z. gardneri Engler																														
*Z. rhoifolium*Lam.	r		r							r												r		o						
Z. riedelianum Engl.	r							r	o																	r				
Zeyheria montana Mart.	r	o		c	c	f					r			r	r				o	o		o		r		o				
Annonaceae sp. (R8202)																														
Annonaceae sp. (R8222)																														
Chrysobalanaceae (R8289V)																														
Euphorbiaceae R7777																														
Lauraceae sp. (R8072)																														
Lauraceae sp. (R8267)																														
Lauraceae sp. (R7677)																														
Lauraceae sp. (R8018)																														
Myrtaceae sp. (R7699)																														
Myrtaceae sp. (S2243)																														
Myrtaceae sp. (S2236)																														
Myurtaceae sp. (R8260)																														
Myrtaceae R7701																														
Myrtaceae S1127V					r	o	o			o																				
Myrtaceae S1126V					r	o	r																							
Myrtaceae S455																								c						
Myrtaceae Sueli 237																														
Myrtaceae Sueli 238																														
Myrtaceae Sueli 239																														
Myrtaceae sp. (R8226V)																														
Myrtaceae sp. (S2211)																														
Myrtaceae sp. (S2212)																														
Myrtaceae sp. (R8203)																														
Myrtaceae sp. (R8204)																														
Myrtaceae sp. (R8177V)		f																												
Myrtaceae sp. (R8178V)		f		o																										
Myrtaceae sp. (R8217)																														
Myrtaceae sp. (R8224)																														
Myrtaceae sp. (R8225)																														
Myrtaceae sp. (S2217)																														
Myrtaceae sp. (R8228)																														
Myrtaceae sp. (S2236)																														
Myrtaceae sp. (R8258V)																														
Myrtaceae sp. (R8276V)																														
Myrtaceae sp. (S2261)																														
Myrtaceae sp. (S2262)																														
Myrtaceae sp. (S2263)																														
Myrtaceae sp. (R7981A)																														
Myrtaceae sp. (R8017)																														
Myrtaceae sp. (R7847V)																														
Myrtaceae sp. (R7848V)																														

Continua ...

Tabela 2. Espécies encontradas nos 170 levantamentos rápidos realizados em Cerrado sentido amplo no Bioma Cerrado. Para ajustar a tabela, os levantamentos para as 576 espécies encontram-se agrupados em blocos de aproximadamente 25 localidades.

Espécies	Código das Localidades																							
	MGPD*	MGDE*	MGJO*	MGAO*	MGAS*	MGFO*	MGFR*	MGFM*	MSCM*	MSCP*	MSPU*	MSPA*	GOIT*	MSCO*	MSSG*	MSAQ*	MSAU*	MSAI*	MSCI*	MSBO*	MSBN*	MSBD*	MSFE*
Abarema cochliacarpos (Gomes) R.C. Barneby & J.W. Grimes															r								
Abuta grandifolia (Mart.) Sandw.	r	f			o		r	o					r	r	o	o							
A. selloana Eichler									r	r	o	r							r	o	a	r	f
Acacia paniculata Willd.										o				r		o	o			r	o	o	o
A plumosa Lowe					r					r					o								
A. aff. *polyphylla* DC.									r		f			f		c	o			r			o
Acosmium dasycarpum (Vog.) Yakovlev																							
A. nitens (Vog.) Yakovlev		o		r	o				r											r			o
A. subelegans (Mohl.) Yakovlev																							
Acrocomia aculeata (Jacq.) Lodd. ex Mart.					r					r													
Aegiphila lhotskyana Cham.					o				r														
Agonandra brasiliensis Miers																							
Aiouea trinervis Meissn.																							
Albizzia niopoides (Spruce ex Benth.) Burk.																							
Alchornea schomburgkii Klotzsch																							
Alibertia concolor (Cham.) K. Schum.																							
A. edulis (L. Rich.) A. Rich.					a				r		f	f	o		o	r	o	c	f				
A. elliptica (Cham.) K. Schum.	a	o	f																				
A. obtusa Cham.	o				r				r		r	o	o				r	r			o		
A. sessilis (Cham.) K. Schum.						r		r								r			o				r
A. verrucosa S. Moore																							
Alibertia sp. (R7844V)																							
Alibertia sp. (R7922)																							
Allophylus edulis Radlk. ex Warm.																							
Aloysia virgata Juss.																							
Amburana cearensis (Fr.Allem.) A.C.Sm.																							
Anacardium occidentale L.	o	r			r																		
Anadenanthera colubrina (Vell.) Brenan var. cebil (Griseb.) Altschul														f		f		c			o		
A. peregrina (Benth.) Speg.									f	c	c	c	f		o	f							f
Andira cordata Arroyo ex R. T. Pennington						r	r	c															
A. cuiabensis Benth.							r	r				r	f					r					
A. vermifuga (Mart.) Benth.	c	a	f					o	r		r	o			o		r	o	r	r	o		o
Annona aurantiaca Barb. Rodr.																							
A. coriacea Mart.					a				f	r	f	o	f	o	f		o		f	f	o		f
A. crassiflora Mart.	o	r		r	o			r			f	r	c	r	r		r						
A. dioca A . St.-Hil.																							
A. tomentosa R.E. Fr.			o	r							c			r									

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MGPD*	MGDE*	MGJO*	MGAO*	MGAS*	MGFO*	MGFR*	MGFM*	MSCM*	MSCP*	MSPU*	MSPA*	GOIT*	MSCO*	MSSG*	MSAQ*	MSAU*	MSAI*	MSCI*	MSBO*	MSBN*	MSBD*	MSFE*
Annona sp. (R8012)																							
Antonia ovata Pohl							r																
Apeiba tibourbou Aubl.																							
Apuleia leiocarpa J. Macbr.																							
Aspidosperma cylindrocarpum Müll. Arg.																							
A. macrocarpon Mart.	o	r	r			r	r	o	r	r			o	r			r			r			
A. multiflorum A. DC.																							
A. nobile Müll. Arg.									r	r	r	r		c			r	o	r				
A. parvifolium A. DC.																							
A. subincanum Mart.											o				r		f			r	r		o
A. tomentosum Mart.	o	o	r	r	o		o	f	o			f	c	f				o	o		f		o
Astrocaryum aculeatum G. Mey																							
A. vulgare Mart.																							
Astronium fraxinifolium Schott	o		o		r					o	f		f	f		o	f	o	o	r		a	r
A. urundeuva Fr. Allem.										r						f	c			o	a	r	o
Attalea humilis Mart.																							
A. phalerata Mart.																r							
A. speciosa Mart. ex Spreng.																							
Austroplenckia populnea (Reissek) Lundell			r									r				c					f		
Baccharis dracunculifolia DC.																				f			
Banisteriposis latifolia (A. Juss.) Cuatrec.											r	f											
Banisteriopsis sp. (S755)																							
Bauhinia bongardii Steud.				o																			
B. cupulata Benth.																							
B. dubia G. Don.																							
B. mollis Walp.																							
B. pulchella Benth.																							
B. rufa (Bong.) Steud.									f	f	f	f	f										
B. ungulata L.									o				r										
*Bauhinia*sp. (R7515V)																			c				
Bauhinia sp. (R7558)																							
Bauhinia sp. (R7559)																							
Bauhinia sp. (S759)																							
Blepharocalyx salicifolius (Kunth) O. Berg				r										r									
Borojoa lanceolata (Cham.) Cuatrec.																							
Bowdichia virgilioides Kunth	o		a	c	c	o	f	f	o	r	f	o	f	o	f		r	o					r
Bredemeyera brevifolia Klotzsch ex A.W. Benn.																							
B. floribunda Willd.																							
Brosimum gaudichaudii Trécul			o	c	o		o	r	f	o	c	c	o	f	f		f					r	r
Buchenavia tetraphylla (Aubl.) R.A. Howard																							
B. tomentosa Eichler			o						r	c	o		o	o				o	o				
Butia leiospatha (Mart.) Becc.												o									c		

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MGPD*	MGDE*	MGJO*	MGAO*	MGAS*	MGFO*	MGFR*	MGFM*	MSCM*	MSCP*	MSPU*	MSPA*	GOIT*	MSCO*	MSSG*	MSAQ*	MSAU*	MSAI*	MSCI*	MSBO*	MSBN*	MSBD*	MSFE*
Byrsonima basiloba A. Juss.					o							r		r	r								
B. coccolobifolia Kunth					r		r	o			o	o	r	o	o	o	r	o	r		o	r	r
B. correaefolia A. Juss.		o																					
B. crassa Nied.	o	c	r	o	o	c	o	o			o	r			o			r					
B. crassifolia (L.) Kunth																							
B. gardnerana A. Juss.																							
B. inodorum S. Moore																							
B. intermedia A. Juss.			o				r	f			f	f	f	r					r				
B. cf. oblongifolia A. Juss																							
B. sericea DC.																							
B. sessilifolia Benth.																							
B. stipulacea Adr. Juss.																							
B. vacciniaefolia A. Juss.																							
B. verbascifolia Rich. ex A. Juss.				r	o		r	f		r		r	r	o						r			
Byrsonima sp. (R7742V)																							
Byrsonima sp. (R7756V)																							
Cabralea canjerana (Vell.) Mart.																							
Caesalpinia bracteosa Tul.																							
Callisthene fasciculata (Spreng.) Mart.																	a			f		c	
C. cf. hassleri Briq.														a				a					
C. major Mart.									o	r		o						r					f
C. minor(Mart)						o																	
Callisthene cf. *mollissima* Warm.																							
Calophyllum brasiliense Cambess.																							
Calotropis procera Dryend.																							
Calycophyllum multiflorum Griseb.																				r	r		
Campomanesia eugenioides Blume																							
C. cf. xanthocarpa O. Berg																							
*Caraipa densiflora*Mart.																							
Cardiopetalum calophyllum Schltdl.																							
Cariniana domestica Miers																							
C. rubra Miers																							
Caryocar brasiliense Cambess.	f	f	f	f			r	o	f	f	f	o	o	f	o		r						r
C. coriaceum Wittm.																							
Casearia arborea Urb.																							
C. grandiflora Cambess.											o												
C. javitensis Kunth																							
C. rupestris Eichler																r				c			
C. sylvestris Sw.	o	o	f	c	c	r	o	o	f	o	c	f	f	o		r	o	f	f	r			f
Cecropia cyrtostachya Miq.																							
C. pachystachya Trécul												f				o			o	r	r		o
Cedrella fissilis Vell.																							
Ceiba speciosa (A.St.-Hil.) Gibbs & Semir																							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																						
	MGPD	MGDE	MGJO	MGAO	MGAS	MGFO	MGFR	MGFM	MSCM	MSCP	MSPU	MSPA	GOIT	MSCO	MSSG	MSAQ	MSAU	MSAI	MSCI	MSBO	MSBN	MSBD	MSFE
Celtis pubescens (Kunth) Spreng.									r											r	r		
Celtis sp. (R7548)																							r
Cenostigma macrophyllum Tul.																							
Cenostigma sp. (S552)																							
Cereus jamacaru DC.																							
Chaetocarpus echinocarpus (Baill.) Ducke															a								
Chamaecrista orbiculata (Benth.) Irwin & Barneby				o		a																	
Cheiloclinium cognatum (Miers) A. C. Sm.																							
Chiococcoa alba Hitchc.																							
Chomelia obtusa Cham. & Schltdl.																							
C. pohliana Müll. Arg.																							
C. ribesioides Benth.																							
Chrysophyllum arenarium Fr. Allem																							
C. marginatum Radlk.																			r				
C. rufum Mart.																							
Chrysophyllum sp. (S554)																							
*Chrysophylum*sp. (R7614)																							
Clusia sellowii Schltdl.																							
Coccoloba brasiliensis Nees & Mart.						r	r																
C. mollis Casar.										o		o	o		r								
Cochlospermum orinocense Steud.																							
C. regium (Schrank) Pilg.																							
C. vitifolium (Willd.) Spreng.																							
Combretum duarteanum Cambess.																							
C. mellifluum Eich.				o																			
Connarus suberosus Planch.	o	o	o	o	o	f	f	c	o	o	f	o	f	f		a			f				
Copaifera langsdorfii Desf.	f	c	f	f	o		r	r	o	o	o	f	r	r	o		o						r
C. martii Hayne			r				r							f			f	f	o				
Cordia alliodora (Ruiz & Pav.) Oken																							
C. anabaptista Cham.																							
C. glabrata (Mart.) A. DC.																							
C. insignis Cham.																							
C. sellowiana Cham.															o	f							
C. trichotoma (Vell.) Arrab.																							
Cordia sp. (R7973V)																							
Couepia grandiflora (Mart. & Zucc.) Benth.o		r	o	r	r			r	o		r	r	f	o									
Coussarea hydrangeaefolia Benth. & Hook.														c				r					r
Croton urucurana Baill.																							
Croton sp. (R8122)																							
Cupania rugosa Radlk.																							
C. vernalis Cambess.																			r		r		
Curatella americana L.	f								f	r		o		o	f	a	o	f	f	o	f	c	

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MGPD*	MGDE*	MGJO*	MGAO*	MGAS*	MGFO*	MGFR*	MGFM*	MSCM*	MSCP*	MSPU*	MSPA*	GOIT*	MSCO*	MSSG*	MSAQ*	MSAU*	MSAI*	MSCI*	MSBO*	MSRN*	MSBD*	MSFE*
Cybianthus detergens Mart.																							
Cybistax antisyphilitica Mart.											r		r				r	o					
*Dalbergia cuiabensis*Benth.																							
D. glandulosa Benth.																							
D. miscolobium Benth.				o		f	r	o	r	o	o		r	r	o		r						
Davilla elliptica A. St.-Hil.	o	o	o	r	f		o	c			o	o	o							r	o		
Desmoncus orthocanthos Mart.																							
Didymopanax distractiflorum Harms														r									
D. gardnerianum Tul.																							
D. macrocarpum (Cham. & Schltdl.) Seem.					r	r		f		r	r	r											
D. morototoni Decne. & Planch.															o								
D. vinosum (Cham. & Schltdl.) March.			r	r			r				r												
Didymopanax sp. (S1092)																							
Didymopanax sp. (R8142V)																							
Didymopanax sp. (RS1004)																							
Dilodendron bipinnatum Radlk.													r			f	o			r	c	f	o
Dimorphandra mollis Benth.	o	o	o	f	r		c	f	f	c	c	c			f	f	o		f	o	c	r	o
Diospyros burchellii Hiern																							
D. hispida DC.	o	o	o	o	f				o	c		f	a	o	o		o						o
Diospyros sericea DC.																							
Diospyros sp. (R7953V)																							
Dipteryx alata Vogel					r			f	o	f	o			o		r	o	o	o	o	o	f	o
Diptychandra aurantiaca (Mart.) Tul.								f	r	o	f	a				-		f	o			r	
Doliocarpus dentatus (Aubl.) Standl. Ssp. Dentatus																							
Duguetia furfuracea (A. St.-Hil.) Benth. & Hook.	o	f	c	a	f		f		a		a		c	f			r	r	f	r	f		o
D. glabriuscula R. E. Fries																							
D. lanceolata A. St.-Hil.																							
D. margraviana Mart.																	r						
Emmotum nitens (Benth.) Miers			o	r		o	o	r				o	o	r									
Enterolobium contortisiliquum (Vell.) Morong																				r			
E. gummiferum (Mart.) J. Macbr.	o		o	r			r	r						r									
Ephederanthus parviflorus S. Moore																							
Eremanthus glomerulatus Less.								r															
E. goyazensis Sch. Bip.																							
E. mattogrossensis Kuntze																							
E. rondoniensis MacLeish & Schumacher																							
Eriotheca gracilipes (Schum.) Robyns	r		f	o		o	o	r	c		a	a	a	a	f		o		f				
E. parvifolia (Mart. & Zucc.) A. Robyns																							
E. pubescens (Mart. & Zucc.) Schott. & Endl.									o	a		o			o								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MGPD*	MGDE*	MGJO*	MGAO*	MGAS*	MGFO*	MGFR*	MGFM*	MSCM*	MSCI*	MSPU*	MSPA*	GOIT*	MSCO*	MSSG*	MSAQ*	MSAU*	MSAI*	MSCI*	MSBO*	MSBN*	MSBD*	MSFE*
Eriotheca sp. (R7863V)																							
Erythroxylum cf. anguifugum Mart.																							
E. betulaceum Mart.		r	o																				
E. campestre A.St.-Hil.																							
E. cuneifolium Poepp. ex O.E. Schulz																							
E. daphnites Mart.																		c					
E. deciduum A. St.-Hil.											r	o											r
E. engleri O . E. Schulz																							
E. pruinosum O. E. Schulz																							
E. suberosum A. St.-Hil.	r			r	o	r	r	r			r		o	o	o	f			r		o	o	
E. tortuosum Mart.					r																		
Erythroxylum sp. (S1006)		r																					
Erythroxylum sp. (R7600)																							
Erythroxylum sp. (R7870)																							
Erythroxylum sp. (R7870V)																							
Eschweilera nana (Berg) Miers											o			c									
E. aurata O. Berg																							
E. biflora DC.																							
E. chrysantha O. Berg																							
E. dysenterica DC.	a	f	f	f	a				r														
E. florida DC.																							
E. cf. gemmiflora O. Berg																							
E. pumila Pohl				r																			
E. punicifolia (Kunth) DC.																							
Eugenia sp. (R7873)																							
Eugenia sp. (R7944)																							
Eugenia sp. (R7959)																							
Eupatorium squalidum DC.																							
Euplassa inaequalis (Pohl) Engl.									o														
Ferdinandusa elliptica Pohl																							
Genipa americana L.																r							
Guapira opposita (Vell.) Reitz.																							
Guazuma ulmifolia Lam.										o						r	o		r	o	o		o
Guettarda viburnioides Cham. & Schltdl.											c		o				f		r		c		o
Hancornia. speciosá Gomez		r	r	r		r		o	r	r	o			r	r								
Heisteria ovata Benth.		r	f	c		f	f											r					
Heisteria sp. (S553)																							
Helicteres lhotskyana K. Schum.																							r
Helicteres brevispira A. Juss.																							
H. macropelata A . Juss.																r	o						
Heteropterys byrsonimifolia A. Juss.	r																	f	r				
Himatanthus articulatus (Vahl) Woodson																							
H. obovatus (Müll. Arg.) Woodson	r		o	o	o	f	r	r	o	r	f		r	r	o	o			r				

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MGPD*	MGDE*	MGJO*	MGAO*	MGAS*	MGFO*	MGFR*	MGFM*	MSCM*	MSCP*	MSPU*	MSPA*	GOIT*	MSCO*	MSSG*	MSAQ*	MSAU*	MSAI*	MSCI*	MSBO*	MSBN*	MSBD*	MSFE*
H. sucuuba (Spruce ex Mull. Arg.) R.E. Woodson																							
Hirtella ciliata Mart. ex Zucc.						a	o	a															
H. burchellii Britton																							
H. glandulosa Spreng.			r																				
H. gracilipes (Hooker f.) Prance																							
Hymenaea courbaril L. var. *stilbocarpa* (Hayne) Lee & Lang.																							
H. eriogyne Benth.																							
H. stigonocarpa Mart. ex Hayne	f	f	a	a	o		o	o	o	o	o			f	o	o	o	o	o	r		r	o
Hyptidendron canum (Pohl ex Benth.) Harley										r	f			c									
Inga cf. *affinis* DC.																					r		
I. alba Willd.															o								
Inga sp. (R7550)																							r
Jacaranda brasiliana Pers.																			r				
J. caroba (Vell.) DC.															r		r						
J. cuspidifolia Mart.																o				r	r		r
J. macrantha Cham.																							
J. rufa Silva Manso																							
Jatropha vitifolia Mill.																							
Kielmeyera coriacea (Spreng.) Mart.	r	o	o	o	o		r	o			o	o	o	o	o	r	r	r		r	r		
K. lathrophyton Saddi				f		f	o	o															
K. rubriflora A. St.-Hil.				r					r														
K. speciosa A. St.-Hil.										r													
Kielmeyera sp. (R7954)																							
Lacistema aggregatum (Berg) Rusby																							
L. gardneri Kuntze																							
Laoensia pacari A. St.-Hil.	r	r	r	r	r		r			r	r	r	r		o	a	o	o	c	a	a	a	o
Licania gardneri Kuntze																							
L. humilis Cham. & Schltdl.									r	f													
L. octandra (Hoffm. ex Roem & Schult.) Kuntze																			r				
L. sclerophylla Mart.ex Hook.f.											o	f	r										
*Licania*sp. (S1082)																							
Licania sp. (R7601)																							
Linociera hassleriana (Chodat) Hassler																	f						c
Lithraea molleoides (Vell.) Engl.																							f
Ludwigia nenosa (Poir.) Ham.																							
Luehea candicans Mart.																		r					
L. grandiflora Mart.									r	a	c												
L. paniculata Mart.																c	f			r	a	a	f
L. speciosa Willd.																							
Luetzelburgia auriculata (Allem.) Ducke																							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MGPD*	MGDE*	MGJO*	MGAO*	MGAS*	MGFO*	MGFR*	MGFM*	MSCM*	MSCI*	MSPU*	MSPA*	GOIT*	MSCO*	MSSG*	MSAQ*	MSAU*	MSAI*	MSCI*	MSBO*	MSBN*	MSBD*	MSFE*
L. praecox Harms.															r								
Mabea fistulifera Mart.																							
Macairea radula DC.																	r				r		
Machaerium aculeatum Raddi																							
M. acutifolium Vogel	r		r	r	r	o	o	f	c	a	a	c	a				r		f				
M. angustifolium Mart. ex Benth.																				r			
M. hirtum (Vell.) Stellfeld			a	o	o			o								r					o		r
M. opacum Vogel																							
M. scleroxylon Tul.																							
Machaerium sp. (R8024Va)																							
Maclura tinctoria (L.) Don ex Steud.																r					o		r
Magonia pubescens A. St.-Hil.	o				o					o	c		o			c	c	o	o	c	a	a	f
Maprounea guianensis Aubl.			r	o		o		o							a		f						
Martiodendron parviflorum Amshoff.																							
Matayba guianensis Aubl.							r			a	a	c	r		f			o					o
M. illicifolius Mart. ex Reissek																	r				r		
Maytenus sp. (R7833)																							
Mezilaurus crassiramea (Meissn.) Taub.														r									
M. itauba (Meissn.) Taubert				o	r						f	c	f	o	f			f	f				
Miconia albicans (Sw.) Triana																							
M. burchellii Triana			r								r	r											
M. fallax DC.															r								
M. ferruginata DC.																							
*M. holosericea*Triana																							
M. macrothyrsa Benth.																							
M. pyrifolia Naud.																							
M. rubiginosa (Bonpl.) DC.																							
M. sellowiana Naud.													r										
M. stenostachya DC.																							
Miconia sp. (R7806)																							
Miconia sp. (Sueli 244)																							
Miconia sp. (R8199)																							
Miconia sp. (S2231)																							
Miconia sp. (S2232)																							
Miconia sp. (S2258)				r				r															
Mimosa clausennii Benth.																							
M. exalbenses Barneby																							
M. hebecarpa Benth.																							
M. laticifera Rizzini & Mattos																							
M. pteridifolia Benth.																							
M. sericantha Benth.							o																
Mimosa sp. (S552)																							
Mimosa sp. (R7635V)																							
Micropholis gardneriana (A . DC.) Pierre																							
*Mollia burchelli*Sprague																							
Monnina martiana Klotzsch ex A.W.Benn.																							
Mouriri elliptica Mart.						r	r	f	r			r		f	r				f				

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MGPI*	MGDE*	MGJO*	MGAO*	MGAS*	MGFO*	MGFR*	MGFM*	MSCM*	MSCI*	MSPU*	MSPA*	GOIT*	MSCO*	MSSG*	MSAQ*	MSAU*	MSAI*	MSCI*	MSBO*	MSBN*	MSBD*	MSFE*
M. pusa Gardner																							
Myrcia albo-tomentosa Cambess.													c				r		r				
M. canescens O. Berg																							
M. camapuanensis N. J. E. Silveira																							
M. decrescens O. Berg																							
M. gardneriana O. Berg														r									
M. lanuginosa O. Berg																							
M. cf. lasiopus DC.																							
M. lingua (O. Berg) Mattos																							
M. mutabilis O. Berg																							
M. pallens DC.																							
M. cf. regneliana O. Berg																							
M. rorida Kiaersk.																							
M. rostrata DC.															o								
M. schottiana O. Berg		o																					
M. sellowiana O. Berg																							
M. splendens (Sw.) DC.																							
M. cf. *stictosepala* Kiaersk.																							
M. tomentosa (Aubl.) DC.																				r			r
M. uberavensis O. Berg														o									
Myrcia sp. (R7695V)																							
Myrcia (R7516V)																			r				
*Myrcia*sp. (R8204)																							
Myrcia sp. (S2216)																							
Myrcia sp. (S2233)																							
Myrcia sp. (Sueli 241)																							
Myrcia sp. (Sueli 276)																							
Myrcia sp. (Sueli 275)																							
Myrcia sp. (R8239)																							
Myrcia sp. (R7874V)																							
Myrcia sp. (R7890)																							
Myrcia sp. (R7893)																							
Myrcia sp. (R8239)																							
Myrcia sp. (R8262V)																							
Myrcia sp. (S2211)																							
Myrcia sp. (S2213)																							
Myrcia sp. (S2248)																							
Myrcia sp. (R7890)																							
Myrcia sp. (R7944V)																							
Myrcia sp. (R7927V)																							
Myrcia sp. (R8159V)																							
Myrcia sp. (R8160)																							
Myrcia sp. (R8288)						o	r																
Myrcia sp. (S2350)						o																	

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MGPD¹	MGDE²	MGJO³	MGAO⁴	MGAS⁵	MGFO⁶	MGFR⁷	MGFM⁸	MSCM⁹	MSCP¹⁰	MSPU¹¹	MSPA¹²	GOIT¹³	MSCO¹⁴	MSSG¹⁵	MSAQ¹⁶	MSAU¹⁷	MSAI¹⁸	MSCI¹⁹	MSBO²⁰	MSBN²¹	MSBD²²	MSFE²³
Nectandra cf. *cuspidata* Nees & Mart.															r								
Neea theifera Oerst.				o	o	c	f			r		r	r										
Neea sp. (R7580)																							
Norantea adamantina Cambess.																							
N. goyazensis Cambess.																							
Ocotea minarum Nees Mez.									c												r		
O. suaveolens Hassl.																							
Ocotea sp. (R7775)																							
Ocotea sp. (R8283)																							
Ouratea castaneaefolia Engl.																							
O. floribunda Engl.																							
O. hexasperma (A. St.-Hil.) Benth.	o	r	o	o	o	o		o		r		r	f	o	o				r				
O. spectabilis (Mart.) Endl.			o											o									
Ouratea sp. (S2349)						f																	
Oxandra sessiliflora R.E. Fries																							
Palicourea rigida Kunth				o		r	r	r		r	o	r	o		r								
Parkia platycephala Benth.																							
Peltogyne confertiflora (Hayne) Benth.				r																			
Pera glabrata (Schott.) Baill.																							
Peritassa campestris (Cambess.) A . C.																							
Persea pyrifolia Nees & Mart. ex Nees																							
Physocallyma scaberrimum Pohl																							
Piper aduncum L.																							
Piptadenia gonoacantha (Mart.) Macbride																							
Pithecelobium moniliformis Benth.																							
Piptocarpha rotundifolia (Less.) Baker				r	f		r	r			r												
Pisonia graciliflora Mart.																							
P. noxia Netto var. *noxia*					o																		
P. noxia var.*psammophila* Mart. ex J. A. Schmidt.									o	o	f	f	c										
Pisonia opposita (Vell.) Reitz.																							
Pisonia sp. (R7842)																							
Pisonia sp. (R8293V)							r																
Plathymenia reticulata Benth.			r			o	o				r	f	r	r		o		o			o		
Platonia insignis Mart.																							
Platycyamus regnelli Benth.																							
Platypodium elegans Vogel																							r
Playmiscium floribundum Vogel																							
Pouteria ramiflora (Mart.) Radlk.	o	o	c	a		o	a	f		r	o	o	o	o					o	r			r
P. torta (Mart.) Radlk.		f	a	c		r		f							r								
Protium heptaphyllum (Aubl.) E. K. Marchal															o		f		r		o		c
P. ovatum Engl.	o		c	f				r						r									
Pseudobombax longiflorum (Mart. & Zucc.) Robyns									o	o	o	o	o	c		c		o	r		f	f	
P. marginatum (A. St.-Hil., A. Juss. & Cambess.) Robyns																							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MGPD*	MGDE*	MGJO*	MGAO*	MGAS*	MGFO*	MGFR*	MGFM*	MSCM*	MSCP*	MSPU*	MSPA*	GOIT*	MSCO*	MSSG*	MSAQ*	MSAU*	MSAI*	MSCI*	MSBO*	MSBN*	MSBD*	MSFE*
P. tomentosum (Mart. & Zucc.) Robyns												r				f	c			o	f	f	c
Psidium cinereum Mart. ex DC.																							
P. guianense Sw.																							
P. myrsinoides O. Berg	o	f	o	o			r	o												r		r	
P. pohliana O. Berg									o														
P. warmingianum Kiaersk.							r																
Psidium sp. (S1074)																							
Psidium sp. (R8096)																							
Pterodon polygalaeflora Benth.		o	o	r	f		o	o															
P. pubenscens Benth.	o								r			r											
Qualea dichotoma (Mart.) Warm.															r		r						
Q. grandiflora Mart.	c	c	c	o	a		o		a	c	c	c	c	c	f	c	f		f	c	c	c	f
Q. multiflora Mart.	f				a				o	f	c	a	o	r	f		r	r	f				
Q. parviflora Mart.	f	o	a	f	c	r		f	o	o	o	o	c	o	f	a	r	o	c	o	o		o
Rapanea ferruginea Spreng.																							
R. guianensis Kuntze							o		o				r						r	a			a
R. umbellata Mart.															c								
Remijia amazonica K. Schum.																							
Rhamnidium elaeocarpum Reissek										o			r			o	o			c	a	f	c
Richeria grandis Vahl																							
Rollinia cf. *mucosa* (Jacq.) Baill.										r													
R. silvatica A . St.-Hil.																							
Roupala montana Aubl.	r			f					f	r	o	f	f	o	f	r	f		c		f		
Rourea induta Planch.				f		f	f	o	a	o	f	f	f	f	c		r	o					
Rudgea burchelliana Mull. Arg.																							
R. viburnioides (Cham.) Benth.											o	o	f	o	f		f		f				
Salacia crassifolia (Mart.) Peyr.	c	c	f	o	o			o															
S. elliptica G.Don						r							r										
Salacia sp. (R7633V)																							
Salacia sp. (S2246)																							
Salvertia convallariodora A. St.-Hil.	o	o	o	r	o	o		f	r	r	r			o									
Sapium longifolium (Müll. Arg.) Huber																	o						
S. cf. *obovatum* Klotzsch ex Mull. Arg.																							
S. cf. *petiolare* (Mull. Arg.) Huber																							
Sapium sp. (S1090)																							
Schinopsis brasiliensis Engl.																						r	
Schinus longifolius (Lindl.) Speg. var. paraguariensis (Hassler) Barkl.																							
Sclerolobium aureum (Tul.) Benth.	f		r		r				f	o	o	r		f	f	c	r		o	f	f	a	f
S. paniculatum Vogel			r	o	r	a	c	c					o										
Sebastiana brasiliensis Spreng.																							
Senna macranthera (DC. ex Coll.) Irwin & Barneby																							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MGPD*	MGDE*	MGJO*	MGAO*	MGAS*	MGFO*	MGFR*	MGFM*	MSCM*	MSCP*	MSPU*	MSPA*	GOIT*	MSCO*	MSSG*	MSAQ*	MSAU*	MSAI*	MSCI*	MSBO*	MSBN*	MSBD*	MSFE*
S. silvestris (Vell.) Irwin & Barneby																							
S. spectabilis (DC.) Irwin & Barneby																							
S. velutina (Vogel) H.S. Irwin & R.C. Barneby																							
Simaba blanchetti Turcz.		r	c																				
Simarouba versicolor A. St.-Hil.	r	o			r				o		f			o		f	o		r	r			
Simira rubescens (Bent.) Bremk. ex Steyemark																							
Siparuna guianensis Aubl.															o								
Siphoneugena densiflora O. Berg																							
Solanum crinitum Lam.																							
S. lycocarpum St. Hil.					r			r															
Solanum sp. (Rosanna 144)																							
Sorocea guilleminiana Gaudich.																							
Spiranthera odoratissima A . St-Hil.																							
Spondias mombin L.																						r	
Sterculia striata A. St.-Hil. & Naud.																					r		r
Strychnos pseudoquina A. St.-Hil.		r	r	r			r	r		r		r	f	o			r		o				
Stryphnodendron adstringens (Mart.) Cov.				o		r	r								o		o	o	o	o			
S. coriaceum Benth.							r	f															
S. obovatum Benth.			o			o	o		f	f	c	f	c	f	r						f		o
Styrax ambiguus Seubert																							
S. camporum Pohl																							
S. ferrugineus Nees & Mart.										r		o	r		r								o
Swartzia sp.(S1032)																							
Syagrus comosa (Mart.) Mart.																							
S. flexuosa (Mart.) Becc.					o																r		
S. oleracea (Mart.) Becc.																o	r		r				
Symplocos nitens (Pohl.) Benth.															r								
Tabebuia aurea (Manso) Bentham & Hook.f. ex S. Moore		r	r		r			r	o		o	o	f		o				r	r	c	o	r
T. impetiginosa (Mart.) Standl.																					o		r
T. ochracea (Cham.) Standl.				r	o		r	f	r	o	f	o	c	c		c	o	o	f		c	r	o
T. roseoalba (Ridley) Sandw.																r	f			o	o		o
T. serratifolia (Vahl.) Nich.								r															
Tapirira guianensis Aubl.							o						o	o	c	f	r	o	o		r		f
Tapura amazonica Poepp. & Endl.																							
Terminalia argentea Mart. & Zucc.	a				r				a	o	a	a	o	o		a			c	a	a	a	a
T. fagifolia Mart. & Zucc.		o	c	f		f	c	f									r	a					r
T. glabrescens Mart.							f								o								
T. phaeocarpa Eichl.																							
Tetragastis balsamifera (Swartz) O. K.																							
T. unifoliolata (Engl.) Cuatrec.																							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MGPD*	MGDE*	MGJO*	MGAO*	MGAS*	MGFO*	MGFR*	MGFM*	MSCM*	MSCP*	MSPU*	MSPA*	GOIT*	MSCO*	MSSG*	MSAQ*	MSAU*	MSAI*	MSCI*	MSBO*	MSBN*	MSBD*	MSFE*
Tibouchina candolleana Cogn.															c								
Tocoyena brasiliensis Mart.																							
T. formosa (Cham. & Schltdl.) Schum.	r		r				o		r	o	o	o											
Tontelea brachypoda Miers																							
Toulicia crassifolia Radlk.			r																				
T. tomentosa Radlk.				c		r																	
Tratinickia rhoifolia Willd.																							
Trema micrantha Blume																			r				o
Trichilia catigua C. DC.																							
T. elegans A. Juss.																					r		
T. pallida Sw.																							
Unonopsis sp. (S2250)																							
Vanillosmopsis. pohlii Baker																							
Vatairea macrocarpa (Benth.) Ducke	c	c				o	o	r	c	a	c	c	c	f		r		o	o				
Vellozia squamata Pohl								o															
Vernonia ferruginea Less.			f	r	r					r	r	o	o				o		r		f		r
Virola sebifera Aubl.															f								
V. subsessilis Warb.																							
Vismia glaziovii Rouhl.																							
V. decipiens Cham. & Schltdl.																							
V. guianensis (Aubl.) Choisy																							
Vismia sp. (S1072)																							
Vismia sp. (R7843)																							
Vitex cymosa Bert.ex Spreng.																							
V. panshiniana Moldencke																							
V. polygama Cham.										r						f				r			
V. regnelliana Moldencke																							
Vitex sp. (S1032)																							
Vochysia cinnamomea Pohl											r	f			r								
V. elliptica (C. K. Spreng.) Mart.				f		c	o																
V. gardneri Warm.	c	c		o			r	a															
V. haenkeana Mart.																							
V. rufa (C. K. Spreng.) Mart.			c		c							o		f					o				
V. thyrsoidea Pohl				r		c		r															
V. tucanorum (C.K. Spreng.) Mart.															a								
Ximenia americana L.																				r			
Xylopia aromatica Lam.	o		r						o		r		o	o	c		c	o	c				
X. sericea A. St.-Hil.				r			r																
Xylosma cf. *benthamii* Triana & Planch,																							
Zanthoxylum caribaeum Lam.																							
Z. cinereum Lam.																							
Z. gardneri Engler																							
*Z. rhoifolium*Lam.													o		r					r			

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MGPD	MGDE	MGJO	MGAO	MGAS	MGFO	MGFR	MGFM	MSCM	MSCP	MSPU	MSPA	GOIT	MSCO	MSSG	MSAQ	MSAU	MSAI	MSCI	MSBO	MSBN	MSBD	MSFE
Z. riedelianum Engl.									r							r	o		r	o			o
Zeyheria montana Mart.				r	r											o			r		r		
Annonaceae sp. (R8202)																							
Annonaceae sp. (R8222)																							
Chrysobalanaceae (R8289V)						f																	
Euphorbiaceae R7777																							
Lauraceae sp. (R8072)				o																			
Lauraceae sp. (R8267)																							
Lauraceae sp. (R7677)																							
Lauraceae sp. (R8018)																							
Myrtaceae sp. (R7699)																							
Myrtaceae sp. (S2243)																							
Myrtaceae sp. (S2236)																							
Myurtaceae sp. (R8260)																							
Myrtaceae R7701																							
Myrtaceae S1127V																							
Myrtaceae S1126V																							
Myrtaceae S455																							
Myrtaceae Sueli 237																							
Myrtaceae Sueli 238																							
Myrtaceae Sueli 239																							
Myrtaceae sp. (R8226V)																							
Myrtaceae sp. (S2211)																							
Myrtaceae sp. (S2212)																							
Myrtaceae sp. (R8203)																							
Myrtaceae sp. (R8204)																							
Myrtaceae sp. (R8177V)																							
Myrtaceae sp. (R8178V)																							
Myrtaceae sp. (R8217)																							
Myrtaceae sp. (R8224)																							
Myrtaceae sp. (R8225)																							
Myrtaceae sp. (S2217)																							
Myrtaceae sp. (R8228)																							
Myrtaceae sp. (S2236)																							
Myrtaceae sp. (R8258V)																							
Myrtaceae sp. (R8276V)																							
Myrtaceae sp. (S2261)																							
Myrtaceae sp. (S2262)																							
Myrtaceae sp. (S2263)																							
Myrtaceae sp. (R7981A)																							
Myrtaceae sp. (R8017)																							
Myrtaceae sp. (R7847V)																							
Myrtaceae sp. (R7848V)																							

Continua ...

Tabela 2. Espécies encontradas nos 170 levantamentos rápidos realizados em Cerrado sentido amplo no Bioma Cerrado. Para ajustar a tabela, os levantamentos para as 576 espécies encontram-se agrupados em blocos de aproximadamente 25 localidades.(Continuação)

Espécies	Código das Localidades																						
	MSGU	MSGL	MSPR	MSIN	MSFR	MSPO	MSSE	MSTR	MSAC	MSAL	MSAG	MSRI	MSAN	MSMA	MSSO	MSAP	MSND	MTNV	MTCA	MTCM	MTCP	MTRI	MTRB
Abarema cochliacarpos (Gomes) R.C. Barneby & J.W. Grimes																		r				r	
Abuta grandifolia (Mart.) Sandw.																					f		
A. selloana Eichler																							
Acacia paniculata Willd.																							
A plumosa Lowe																							
A. aff. polyphylla DC.			o		o	r	r	r					f						r				o
Acosmium dasycarpum (Vog.) Yakovlev																							
A. nitens (Vog.) Yakovlev	f	o		c	f	r	o	o				o	f		o	a	f						
A. subelegans (Mohl.) Yakovlev	r	o												c	o		o			f	c		
Acrocomia aculeata (Jacq.) Lodd. ex Mart.					r	r		r			r	r	r		r							r	r
Aegiphila lhotskyana Cham.	r	o	o	r	r								r		r		r					r	
Agonandra brasiliensis Miers																							
Alouea trinervis Meissn.																							
Albizzia niopoides (Spruce ex Benth.) Burk.																							
Alchornea schomburgkii Klotzsch																							
Alibertia concolor (Cham.) K. Schum.			o	o	f	o			r	r	f	o	c			r				r			
A. edulis (L. Rich.) A. Rich.																							
A. elliptica (Cham.) K. Schum.				r		r		r		r		r	o	o	f	r							
A. obtusa Cham.	o	o																					
A. sessilis (Cham.) K. Schum.																							
A. verrucosa S. Moore																							
Alibertia sp. (R7844V)																							
Alibertia sp. (R7922)	f	o													r								
Allophylus edulis Radlk. ex Warm.														o									
Aloysia virgata Juss.																							
Amburana cearensis (Fr. Allem.) A.C.Sm.																			o	o			
Anacardium occidentale L.		o		f			a							a									
Anadenanthera colubrina (Vell.) Brenan var. cebil (Griseb.) Altschul	o	c	r						a	f	c	c			f	f					f		
A. peregrina (Benth.) Speg.																							
Andira cordata Arroyo ex R. T. Pennington			r															c/f	r	o	f		c
A. cuiabensis Benth.		r	f	o	o	o	o	o	o	o	o	o	o		r							r	f
A. vermifuga (Mart.) Benth.																							
Annona aurantiaca Barb. Rodr.	f	c	f	o	f	f			o	f	f	o	f		o	c		o	r			o	f
A. coriacea Mart.			o	r					f	o		r	o									o	c
A. crassiflora Mart.			r			r																	
A. dioca A . St.-Hil.																							r
A. tomentosa R.E. Fr.																							
Annona sp. (R8012)																							
Antonia ovata Pohl																							
Apeiba tibourbou Aubl.																							
Apuleia leiocarpa J. Macbr.																							
Aspidosperma cylindrocarpum Müll. Arg.					o					r	o		r			r		o			o	r	
A. macrocarpon Mart.																		r					
A. multiflorum A. DC.				r	r	r				o	o	r	r					r	f			o	f
A. nobile Müll. Arg.																							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MSGU*	MSGL*	MSPR*	MSIN*	MSFR*	MSPO*	MSSE*	MSTR*	MSAC*	MSAL*	MSAG*	MSRI*	MSAN*	MSMA*	MSSO*	MSAP*	MSND*	MTNV*	MTCA*	MTCM*	MTCP*	MTRI*	MTRB*
A. parvifolium A. DC.																				r			
A. subincanum Mart.		f				r	a	f						r	r		o			o	f		
A. tomentosum Mart.	o	c						r			f		c		o			f	o		o	r	f
Astrocaryum aculeatum G. Mey																							
A. vulgare Mart.																							
Astronium fraxinifolium Schott	r	r	r	o	a	f	a	r					o		o	r	o	r		o	f	a	r
A. urundeuva Fr. Allem.	o	o	r				c	a					r	a	o		f						
Attalea humilis Mart.																							
A. phalerata Mart.																							
A. speciosa Mart. ex Spreng.																							
Austroplenckia populnea (Reissek) Lundell									f			o						r					
Baccharis dracunculifolia DC.																							
Banisteriopsis latifolia (A. Juss.) Cuatrec.																							
Banisteriopsis sp. (S755)																							
Bauhinia bongardii Steud.																							
B. cupulata Benth.	c																o				c		
B. dubia G. Don.																							
B. mollis Walp.																							
B. pulchella Benth.																							
B. rufa (Bong.) Steud.			c	o	f	f		o	f	o		f			f	o	f						
B. ungulata L.					o	o		o		o	o	f	o				o						
*Bauhinia*sp. (R7515V)																							
Bauhinia sp. (R7558)	f																						
Bauhinia sp. (R7559)	r																						
Bauhinia sp. (S759)																							
Blepharocalyx salicifolius (Kunth) O. Berg																							
Borojoa lanceolata (Cham.) Cuatrec.																							
Bowdichia virgilioides Kunth		o	f	f	c	r				o	o	o	o					o	r		o		o
Bredemeyera brevifolia Klotzsch. ex A.W. Benn																							
B. floribunda Willd.																							
Brosimum gaudichaudii Trécul	r	o	f	f	o	o		f			o	c	o		r		o	f	f	o			c
Buchenavia tetraphylla (Aubl.) R.A. Howard																		c/f					
B. tomentosa Eichler		o		o	r		o	o	a		a	f										c	
Butia leiospatha (Mart.) Becc.																							
Byrsonima basiloba A. Juss.			f	o	f		r		r	o			r										
B. coccolobifolia Kunth			f	o	a		f		o	f	o	r	r					c	f	o		r	r
B. correaefolia A. Juss.																							
B. crassa Nied.										o								c/f	f	o/f		f	r
B. crassifolia (L.) Kunth																							
B. gardneriana A. Juss.																							
B. inodorum S. Moore																							
B. intermedia A. Juss.			c	f		f		f			f	c	o			o							
B. cf. oblongifolia A. Juss																							
B. sericea DC.																							
B. sessilifolia Benth.																							
B. stipulacea Adr. Juss.																							
B. vacciniaefolia A. Juss.																							
B. verbascifolia Rich. ex A. Juss.			f	f	o		r	o		r			r		r			o	r		r		r
Byrsonima sp. (R7742V)																							
Byrsonima sp. (R7756V)																							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MSGU*	MSGL*	MSPR*	MSIN*	MSFR*	MSPO*	MSSE*	MSTR*	MSAC*	MSAL*	MSAG*	MSRI*	MSAN*	MSMA*	MSSO*	MSAP*	MSND*	MTNV*	MTCA*	MTCM*	MTCI*	MTRI*	MTRB*
Cabralea canjerana (Vell.) Mart.																							
Caesalpinia bracteosa Tul.																							
Callisthene fasciculata (Spreng.) Mart.																				c	c		
C. cf. *hassleri* Briq.																							
C. major Mart.												f											
C. minor(Mart)																							
Callisthene cf. *mollissima* Warm.																							
Calophyllum brasiliense Cambess.																							
Calotropis procera Dryend.																							
Calycophyllum multiflorum Griseb.														r									
Campomanesia eugenioides Blume																							
C. cf. *xanthocarpa* O. Berg			r																				
*Caraipa densiflora*Mart.																							
Cardiopetalum calophyllum Schltdl.																							
Cariniana domestica Miers																							
C. rubra Miers																							
Caryocar brasiliense Cambess.		o	f	f	f	r		f	f	f	o	c	o		f	f	o				r		
C. coriaceum Wittm.																							
Casearia arborea Urb.																							
C. grandiflora Cambess.										o	r	o											
C. javitensis Kunth																							
C. rupestris Eichler	a	c													o								
C. sylvestris Sw.	f	f	o	o	f	f		f	f	o	f	o		r	f	f			f	o		c	c
Cecropia cyrtostachya Miq.																							
C. pachystachya Trécul	o					r	r								r		r						
Cedrella fissilis Vell.																							
Ceiba speciosa (A.St.-Hil.) Gibbs & Semir																							
Celtis pubescens (Kunth) Spreng.						r							r				r						
Celtis sp. (R7548)																							
Cenostigma macrophyllum Tul.																							
Cenostigma sp. (S552)																							
Cereus jamacaru DC.														f									
Chaetocarpus echinocarpus (Baill.) Ducke																							
Chamaecrista orbiculata (Benth.) Irwin & Barneby																							
Cheiloclinium cognatum (Miers) A. C. Sm.																							
Chiococcoa alba Hitchc.																							
Chomelia obtusa Cham. & Schltdl.																							
C. pohliana Müll. Arg.		o						r															
C. ribesioides Benth.																							r
Chrysophyllum arenarium Fr. Allem																							
C. marginatum Radlk.	r							r					r		r								
C. rufum Mart.																							
Chrysophyllum sp. (S554)																							
*Chrysophylum*sp. (R7614)							r																
Clusia sellowii Schltdl.																							
Coccoloba brasiliensis Nees & Mart.																							
C. mollis Casar.				r	o	f	f	o												f			
Cochlospermum orinocense Steud.																							
C. regium (Schrank) Pilg.																						o	
C. vitifolium (Willd.) Spreng.																							
Combretum duarteanum Cambess.																							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MSGU*	MSGL*	MSPR*	MSIN*	MSFR*	MSPO*	MSSE*	MSTR*	MSAC*	MSAL*	MSAG*	MSRI*	MSAN*	MSMA*	MSSO*	MSAP*	MSND*	MTNV*	MTCA*	MTCM*	MTCP*	MTRI*	MTRB*
C. mellifluum Eich.																		c/r					
Connarus suberosus Planch.			o	f	f		r	o	o	c			o	o				f		o		o	f
Copaifera langsdorfii Desf.		c		r	o	r		o	o		f	f	o		r	r		r					
C. martii Hayne																						a	a
Cordia alliodora (Ruiz & Pav.) Oken																							
C. anabaptista Cham.																							
C. glabrata (Mart.) A. DC.																							
C. insignis Cham.																				o			
C. sellowiana Cham.																					o		
C. trichotoma (Vell.) Arrab.	r																						
Cordia sp. (R7973V)																							c
Couepia grandiflora (Mart. & Zucc.) Benth.			f	c	c				f	o		o	o					c					
Coussarea hydrangeaefolia Benth. & Hook.						a					r									o		o	
Croton urucurana Baill.														c									
Croton sp. (R8122)																							
Cupania rugosa Radlk.													r										
C. vernalis Cambess.													c				f	r	o	c	f	f/c	c
Curatella americana L.			a	f	f		f	c	r	o													
Cybianthus detergens Mart.																							
Cybistax antisyphilitica Mart.				r		r				r	o		r			r						r	
*Dalbergia cuiabensis*Benth.																							
D. glandulosa Benth.																							
D. miscolobium Benth.				r	o					r	r	o	o									r	
Davilla elliptica A. St.-Hil.			o	o	o	r	o	o	o	o	o	o	o		r	o		f/o	o	c		f	o
Desmoncus orthocanthos Mart.																							
Didymopanax distractiflorum Harms																							
D. gardnerianum Tul.																							
D. macrocarpum (Cham. & Schltdl.) Seem.					r																		
D. morototoni Decne. & Planch.	r														r								
D. vinosum (Cham. & Schltdl.) March.																							
Didymopanax sp. (S1092)																							
Didymopanax sp. (R8142V)																							
Didymopanax sp. (RS1004)																				f	f		
Dilodendron bipinnatum Radlk.	o					r		r						o	o		r						
Dimorphandra mollis Benth.	o	f	c	c	c	o	r	o	o		o	f	f				o	r	o	o	o		o
Diospyros burchellii Hiern										o	o	f											
D. hispida DC.		r	a	c	a	o			c	c	c	r	o			o		c		o		o	c
Diospyros sericea DC.																							
Diospyros sp. (R7953V)																							
Dipteryx alata Vogel	o	f							r	a		c			r		r			r	o		
Diptychandra aurantiaca (Mart.) Tul.		f		r	a					a	o	a	o										
Doliocarpus dentatus (Aubl.) Standl. Ssp. Dentatus																							
Duguetia furfuracea (A. St.-Hil.) Benth. & Hook.	f	f	c		f			f	o	o	o	c	o		r	a	o	a				r	a
D. glabriuscula R. E. Fries																							
D. lanceolata A. St.-Hil.																				r			
D. margraviana Mart.																							
Emmotum nitens (Benth.) Miers																		o					
Enterolobium contortisiliquum (Vell.) Morong						o																	
E. gummiferum (Mart.) J. Macbr.				r																			

Continua

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MSGU	MSGL	MSPR	MSIN	MSFR	MSPO	MSSE	MSTR	MSAC	MSAL	MSAG	MSRI	MSAN	MSMA	MSSO	MSAP	MSND	MTNV	MTCA	MTCM	MTCP	MTRI	MTRB
Ephederanthus parviflorus S. Moore																							
Eremanthus glomerulatus Less.																							
E. goyazensis Sch. Bip.																							
E. mattogrossensis Kuntze																							
E. rondoniensis MacLeish & Schumacher																							
Eriotheca gracilipes (Schum.) Robyns	o	o	c	f	c	f	o	o	o	o	o	o	f					o			f	r	f
E. parvifolia (Mart. & Zucc.) A. Robyns																							
E. pubescens (Mart. & Zucc.) Schott. & Endl.			f	r	o			o	o	r	o	o							o	f		o	f
Eriotheca sp. (R7863V)																							
Erythroxylum cf. anguifugum Mart.																							
E. betulaceum Mart.																							
E. campestre A.St.-Hil.																							
E. cuneifolium Poepp. ex O.E. Schulz														r									
E. daphnites Mart.							r	r										r	r	r	r	f	o
E. deciduum A. St.-Hil.						r		o															
E. engleri O . E. Schulz																							
E. pruinosum O. E. Schulz																							
E. suberosum A. St.-Hil.		o	o	o	f			o	o	f			o			r		r	o	f		o	o
E. tortuosum Mart.				r																			
Erythroxylum sp. (S1006)																							
Erythroxylum sp. (R7600)					f																		
Erythroxylum sp. (R7870)																							
Erythroxylum sp. (R7870V)																							
Eschweilera nana (Berg) Miers					o				f		c							f					
E. aurata O. Berg																							
E. biflora DC.																							
E. chrysantha O. Berg																							
E. dysenterica DC.	r		r										r									f	o
E. florida DC.	r																						
E. cf. gemmiflora O. Berg																							
E. pumila Pohl																							
E. punicifolia (Kunth) DC.																							
Eugenia sp. (R7873)																							
Eugenia sp. (R7944)																							
Eugenia sp. (R7959)																							
Eupatorium squalidum DC.		r																					
Euplassa inaequalis (Pohl) Engl.																							
Ferdinandusa elliptica Pohl																							
Genipa americana L.	r													r									
Guapira opposita (Vell.) Reitz.																							
Guazuma ulmifolia Lam.	o						o	r							r		r						
Guettarda viburnioides Cham. & Schltdl.		o				c	r	f					r	c						o	f	c	
Hancornia. speciosa Gomez									c	r	r	r	r				r		r	r		r	r
Heisteria ovata Benth.																							
Heisteria sp. (S553)																							
Helicteres lhotskyana K. Schum.																							
Helicteres brevispira A. Juss.																							
H. macropelata A . Juss.		r					r	r												f			
Heteropterys byrsonimifolia A. Juss.																		r	r	r			
Himatanthus articulatus (Vahl) Woodson																							
H. obovatus (Müll. Arg.) Woodson			o	r					r	o	f					r		o	o	o		f/o	o

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MSGU*	MSGL*	MSPR*	MSIN*	MSFR*	MSPO*	MSSE*	MSTR*	MSAC*	MSAL*	MSAG*	MSRI*	MSAN*	MSMA*	MSSO*	MSAP*	MSND*	MTNV*	MTCA*	MTCM*	MTCP*	MTRI*	MTRB*
H. sucuuba (Spruce ex Mull. Arg.) R.E. Woodson																								
Hirtella ciliata Mart. ex Zucc.																								
H. burchellii Britton																								
H. glandulosa Spreng.																								
H. gracilipes (Hooker f.) Prance																								
Hymenaea courbaril L. var.		r																		f				
stilbocarpa (Hayne) Lee & Lang.																								
H. eriogyne Benth.																								
H. stigonocarpa Mart. ex Hayne		o	r	r					r	r	r	o	f					f	o			o	f	
Hyptidendron canum (Pohl ex Benth.) Harley																								
Inga cf. *affinis* DC.																								
I. alba Willd.																								
Inga sp. (R7550)																								
Jacaranda brasiliana Pers.															r									
J. caroba (Vell.) DC.																								
J. cuspidifolia Mart.				r			f	o						o		r					f	r		
J. macrantha Cham.																								
J. rufa Silva Manso																								
Jatropha vitifolia Mill.																								
Kielmeyera coriacea (Spreng.) Mart.			r	o	r			r	o		o	o							o			o	o	
K. lathrophyton Saddi																								
K. rubriflora A. St.-Hil.				r														o				r		
K. speciosa A. St.-Hil.																		f	f	f				
Kielmeyera sp. (R7954)																								
Lacistema aggregatum (Berg) Rusby																								
L. gardneri Kuntze																								
Laoensia pacari A. St.-Hil.		o	o	o	o		o	f	o	f	o	c	o		f		r	f	o	o	o	o		
Licania gardneri Kuntze				r																			c	
L. humilis Cham. & Schltdl.										o		o	r											
L. octandra (Hoffm. ex Roem & Schult.) Kuntze																								
L. sclerophylla Mart.ex Hook.f.																								
*Licania*sp. (S1082)																								
Licania sp. (R7601)					o																			
Linociera hassleriana (Chodat) Hassler	a																							
Lithraea molleoides (Vell.) Engl.	a	r					f	f					f	a	a		a							
Ludwigia nenosa (Poir.) Ham.																								
Luehea candicans Mart.				r	r							r									r			
L. grandiflora Mart.													f											
L. paniculata Mart.	c		r			r	o	o							a		a			c/a	a	a		
L. speciosa Willd.																								
Luetzelburgia auriculata (Allem.) Ducke																								
L. praecox Harms.																								
Mabea fistulifera Mart.					r	r																c		
Macairea radula DC.																							o	
Machaerium aculeatum Raddi																								
M. acutifolium Vogel	o	o	f		o	a	f	r	f	o	o		f		r	o		o		o				
M. angustifolium Mart. ex Benth.																								
M. hirtum (Vell.) Stellfeld																								
M. opacum Vogel																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MSGU*	MSGL*	MSPR*	MSIN*	MSFR*	MSPO*	MSSE*	MSTR*	MSAC*	MSAL*	MSAG*	MSRI*	MSAN*	MSMA*	MSSO*	MSAP*	MSND*	MTNV*	MTCA*	MTCM*	MTCP*	MTRI*	MTRB*
M. scleroxylon Tul.																							
Machaerium sp. (R8024Va)																							
Maclura tinctoria (L.) Don ex Steud.																							
Magonia pubescens A. St.-Hil.	o	o				c	c	f				f				r		r		c	c		
Maprounea guianensis Aubl.																							
Martiodendron parviflorum Amshoff.																							
Matayba guianensis Aubl.			r	a	a	a	c	a	a		c	a	c	o								o	
M. illicifolius Mart. ex Reissek														o									
Maytenus sp. (R7833)																							
Mezilaurus crassiramea (Meissn.) Taub.																		f					a
M. itauba (Meissn.) Taubert												r											
Miconia albicans (Sw.) Triana				f	o				o	f	f	c				r		o					
M. burchellii Triana																							
M. fallax DC.													r										
M. ferruginata DC.																							
*M. holosericea*Triana																							
M. macrothyrsa Benth.																							
M. pyrifolia Naud.																							
M. rubiginosa (Bonpl.) DC.																							
M. sellowiana Naud.																							
M. stenostachya DC.																							
Miconia sp. (R7806)																							
Miconia sp. (Sucli 244)				f																			
Miconia sp. (R8199)																							
Miconia sp. (S2231)																							
Miconia sp. (S2232)																							
Miconia sp. (S2258)																							
Mimosa clausennii Benth.																							
M. exalbenses Barneby																							
M. hebecarpa Benth.					o																		
M. laticifera Rizzini & Mattos			o																				
M. pteridifolia Benth.																							
M. sericantha Benth.																							
Mimosa sp. (S552)																							
Mimosa sp. (R7635V)										f		r											
Micropholis gardneriana (A . DC.) Pierre																							
*Mollia burchelli*Sprague																							
Monnina martiana Klotzsch ex A. W. Benn.																							
Mouriri elliptica Mart.				r	f	o			o	a	f												r
M. pusa Gardner																		f					
Myrcia albo-tomentosa Cambess.			o																				
M. canescens O. Berg																							
M. camapuanensis N. J. E. Silveira					o													r					o
M. decrescens O. Berg																							
M. gardneriana O. Berg																							
M. lanuginosa O. Berg																		a	f				o
M. cf. lasiopus DC.																							
M. lingua (O. Berg) Mattos																							
M. mutabilis O. Berg																							
M. pallens DC.																							
M. cf. regneliana O . Berg																							
M. rorida Kiaersk.																							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MSGU[a]	MSGL[a]	MSPR[a]	MSIN[a]	MSFR[a]	MSPO[a]	MSSE[a]	MSTR[a]	MSAC[a]	MSAL[a]	MSAG[a]	MSRI[a]	MSAN[a]	MSMA[a]	MSSO[a]	MSAP[a]	MSND[a]	MTNV[a]	MTCA[a]	MTCM[a]	MTCP[a]	MTRI[a]	MTRB[a]
M. rostrata DC.			r																				
M. schottiana O. Berg																						f	
M. sellowiana O. Berg																							
M. splendens (Sw.) DC.																							
M. cf. *stictosepala* Kiaersk.																							
M. tomentosa (Aubl.) DC.	r						r	r															
M. uberavensis O. Berg																							
Myrcia sp. (R7695V)																							
Myrcia (R7516V)																							
*Myrcia*sp. (R8204)																							
Myrcia sp. (S2216)																							
Myrcia sp. (S2233)																							
Myrcia sp. (Sueli 241)				c																			
Myrcia sp. (Sueli 276)									c	r	r	o											
Myrcia sp. (Sueli 275)										f	r	c											
Myrcia sp. (R8239)																							
Myrcia sp. (R7874V)																							
Myrcia sp. (R7890)																							
Myrcia sp. (R7893)																							
Myrcia sp. (R8239)																							
Myrcia sp. (R8262V)																							
Myrcia sp. (S2211)																							
Myrcia sp. (S2213)																							
Myrcia sp. (S2248)																							
Myrcia sp. (R7890)																							
Myrcia sp. (R7944V)																							
Myrcia sp. (R7927V)																							
Myrcia sp. (R8159V)																							
Myrcia sp. (R8160)																							
Myrcia sp. (R8288)																							
Myrcia sp. (S2350)																							
Nectandra cf. *cuspidata* Nees & Mart.																							
Neea theifera Oerst.					r													o/r	c				
Neea sp. (R7580)		o																					
Norantea adamantina Cambess.																							
N. goyazensis Cambess.																							
Ocotea minarum Nees Mez.								r				r	r		f								
O. suaveolens Hassl.	r																						
Ocotea sp. (R7775)																							
Ocotea sp. (R8283)																							
Ouratea castaneaefolia Engl.																							
O. floribunda Engl.																							
O. hexasperma (A. St.-Hil.) Benth.				r	r			r		o	o	c				o		f				r	o
O. spectabilis (Mart.) Endl.									r									o/r					o
Ouratea sp. (S2349)																							
Oxandra sessiliflora R.E. Fries																							
Palicourea rigida Kunth			o	o	r				r	o			o					o	f			o	
Parkia platycephala Benth.																							
Peltogyne confertiflora (Hayne) Benth.																		o					
Pera glabrata (Schott.) Baill.																							
Peritassa campestris (Cambess.) A . C.																							
Persea pyrifolia Nees & Mart. ex Nees																							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MSGU[a]	MSGL[a]	MSPR[a]	MSIN[a]	MSFR[a]	MSPO[a]	MSSE[a]	MSTR[a]	MSAC[a]	MSAL[a]	MSAG[a]	MSRI[a]	MSAN[a]	MSMA[a]	MSSO[a]	MSAP[a]	MSND[a]	MTNV[a]	MTCA[a]	MTCM[a]	MTCP[a]	MTRI[a]	MTRB[a]
Physocallyma scaberrimum Pohl																								
Piper aduncum L.																								
Piptadenia gonoacantha (Mart.) Macbride																								
Pithecelobium moniliformis Benth.																								
Piptocarpha rotundifolia (Less.) Baker									f									o/r	o	f				o
Pisonia graciliflora Mart.							r											r	r			o		r
P. noxia Netto var. *noxia*																			r					
P. noxia var.*psammophila* Mart. ex J. A. Schmidt.			f		o			r			r		r		o			o				o		
Pisonia opposita (Vell.) Reitz.																								
Pisonia sp. (R7842)																								
Pisonia sp. (R8293V)																								
Plathymenia reticulata Benth.		r		o	r	f	r	o	o			o	o					r						
Platonia insignis Mart.																								
Platycyamus regnelli Benth.																								
Platypodium elegans Vogel	r						c													f				
Playmiscium floribundum Vogel																								
Pouteria ramiflora (Mart.) Radlk.	r		r	o	o				r	r	r	r	o			o		c	o					f
P. torta (Mart.) Radlk.	r			r	a				a	a	a	r	c											
Protium heptaphyllum (Aubl.) E. K. Marchal	o	r			r		f	o							r					f		o		
P. ovatum Engl.																								
Pseudobombax longiflorum (Mart. & Zucc.) Robyns		r	o	r		r					r	o						o/r	r	o		f		r
P. marginatum (A. St.-Hil., A. Juss. & Cambess.) Robyns																								
P. tomentosum (Mart. & Zucc.) Robyns	c	o	.				o	f						r	r		c			c	c	f		r
Psidium cinereum Mart. ex DC.																								
P. guianense Sw.	r																							
P. myrsinoides O. Berg																								
P. pohliana O. Berg								o	f															
P. warmingianum Kiaersk.																								
Psidium sp. (S1074)																								
Psidium sp. (R8096)																								
Pterodon polygalaeflora Benth.																								
P. pubenscens Benth.		a		r							o							f/c				r		o
Qualea dichotoma (Mart.) Warm.		r				r																		
Q. grandiflora Mart.	o	f	a	c	c	c	f	c	a	c	a	c	a		c	o	o	o	o	o	f	f		o
Q. multiflora Mart.		f	r	r	f	c	o				a	c	f			r	r	f	r/o	f	c	c		
Q. parviflora Mart.		f	a	r	c		o	c	a	a	a	a	a			r	r	f/c	o	o		r		
Rapanea ferruginea Spreng.																								
R. guianensis Kuntze	a	a	r				r						f		f	f	a							
R. umbellata Mart.																								
Remijia amazonica K. Schum.																								
Rhamnidium elaeocarpum Reissek	f	c					f	a					r	c	c		a			o	o			
Richeria grandis Vahl																								
Rollinia cf. *mucosa* (Jacq.) Baill.																								
R. silvatica A . St.-Hil.																								
Roupala montana Aubl.	o		o	o	o	o	o	o			o	o					r	f	o	o		f		o
Rourea induta Planch.			r	o						o	o	o				f		o						r
Rudgea burchelliana Mull. Arg.																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MSGU	MSGL	MSPR	MSIN	MSFR	MSPO	MSSE	MSTR	MSAC	MSAL	MSAG	MSRI	MSAN	MSMA	MSSO	MSAP	MSND	MTNV	MTCA	MTCM	MTCP	MTRI	MTRB
R. viburnioides (Cham.) Benth.																				o			
Salacia crassifolia (Mart.) Peyr.																		o				o	a
S. elliptica G.Don										o													
Salacia sp. (R7633V)										o													
Salacia sp. (S2246)																							
Salvertia convallariodora A. St.-Hil.			a	r	r					r			o					o	o	f	f	r	
Sapium longifolium (Müll. Arg.) Huber						o	r						r	r	r								
S. cf. obovatum Klotzsch ex Mull. Arg.																							
S. cf. petiolare (Mull. Arg.) Huber																							
Sapium sp. (S1090)																							
Schinopsis brasiliensis Engl.																							
Schinus longifolius (Lindl.) Speg. var. paraguariensis (Hassler) Barkl.														r									
Sclerolobium aureum (Tul.) Benth.			f	f	c		f	f	o	f	r	o			r	f		f	o	o	o	f	
S. paniculatum Vogel			r																				
Sebastiana brasiliensis Spreng.																							
Senna macranthera (DC. ex Coll.) Irwin & Barneby																							
S. silvestris (Vell.) Irwin & Barneby																							
S. spectabilis (DC.) Irwin & Barneby																							
S. velutina (Vogel) H.S. Irwin & R.C. Barneby																							
Simaba blanchetti Turcz.																							
Simarouba versicolor A. St.-Hil.				r	r						o		c					o	o		o	e/f	o
Simira rubescens (Bent.) Bremk. ex Steyemark																							
Siparuna guianensis Aubl.																							
Siphoneugena densiflora O. Berg																							
Solanum crinitum Lam.																							r
S. lycocarpum St. Hil.				r															r				
Solanum sp. (Rosanna 144)																							
Sorocea guilleminiana Gaudich.																							
Spiranthera odoratissima A . St-Hil.																							
Spondias mombin L.																							
Sterculia striata A. St.-Hil. & Naud.																							
Strychnos pseudoquina A. St.-Hil.		r		o		r			r	r		o	o			f		f			o		o
Stryphnodendron adstringens (Mart.) Cov.	r	o											r										o
S. coriaceum Benth.																							
S. obovatum Benth.			o	c	c		r	o	o	c	c	c	c		c	o		o					
Styrax ambiguus Seubert																							
S. camporum Pohl																							
S. ferrugineus Nees & Mart.				c	f					f		o	o										
Swartzia sp.(S1032)																							
Syagrus comosa (Mart.) Mart.										o								f	f	o		f	o
S. flexuosa (Mart.) Becc.					o										r			o	o			o	o
S. oleracea (Mart.) Becc.														f									
Symplocos nitens (Pohl.) Benth.																							
Tabebuia aurea (Manso) Bentham & Hook.f. ex S. Moore	f	o	o	o	f		o	o	o	o	o	o	o	r	c		r	c	o	f	f		r

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MSGU	MSGL	MSPR	MSIN	MSFR	MSPO	MSSE	MSTR	MSAC	MSAL	MSAG	MSRI	MSAN	MSMA	MSSO	MSAP	MSND	MTNV	MTCA	MTCM	MTCP	MTRI	MTRB
T. impetiginosa (Mart.) Standl.	r													a						o			
T. ochracea (Cham.) Standl.	o	o	f		f	f		o	f	f		f	c		c	f		f	r	o			r
T. roseoalba (Ridley) Sandw.	r						c							c						c	c		
T. serratifolia (Vahl.) Nich.							r																
Tapirira guianensis Aubl.	o		r		r		f	r	o				r			r	r					r	
Tapura amazonica Poepp. & Endl.																							
Terminalia argentea Mart. & Zucc.	a	a	c	f	o	r	c	a				f	o	a	a	f	a			c	c	a	
T. fagifolia Mart. & Zucc.		r																					
T. glabrescens Mart.						o			c														
T. phaeocarpa Eichl.																							
Tetragastis balsamifera (Swartz) O. K.																							
T. unifoliolata (Engl.) Cuatrec.																							
Tibouchina candolleana Cogn.																							
Tocoyena brasiliensis Mart.		r																					
T. formosa (Cham. & Schltdl.) Schum.				o		f			o	f		o						o	r	o		r	
Tontelea brachypoda Miers																							
Toulicia crassifolia Radlk.																							
T. tomentosa Radlk.																							
Trattinickia rhoifolia Willd.																							
Trema micrantha Blume	o	o													f								
Trichilia catigua C. DC.	o													f									
T. elegans A. Juss.																							
T. pallida Sw.	r																						
Unonopsis sp. (S2250)																							
Vanillosmopsis. pohlii Baker																							
Vatairea macrocarpa (Benth.) Ducke		o								o	f	f						f	o	f	f	o	
Vellozia squamata Pohl																							
Vernonia ferruginea Less.	o	r	c	o	r		f	f				o	f	f		c	c		o		o	o	
Virola sebifera Aubl.						o														o			
V. subsessilis Warb.																							
Vismia glaziovii Rouhl.																							
V. decipiens Cham. & Schltdl.																							
V. guianensis (Aubl.) Choisy																							
Vismia sp. (S1072)																							
Vismia sp. (R7843)																							
Vitex cymosa Bert.ex Spreng.																							
V. panshiniana Moldencke																							
V. polygama Cham.																							
V. regnelliana Moldencke																							
Vitex sp. (S1032)																							
Vochysia cinnamomea Pohl			a	o				r	c	o	o	o											
V. elliptica (C. K. Spreng.) Mart.																							
V. gardneri Warm.																							
V. haenkeana Mart.																							
V. rufa (C. K. Spreng.) Mart.																		f	o	o	r	o	o
V. thyrsoidea Pohl																							
V. tucanorum (C.K. Spreng.) Mart.												r											
Ximenia americana L.															r								
Xylopia aromatica Lam.			r	o	a	a	r	r	a		o	o	o									o	

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MSGU*	MSGL*	MSPR*	MSIN*	MSFR*	MSPO*	MSSE*	MSTR*	MSAC*	MSAL*	MSAG*	MSRI*	MSAN*	MSMA*	MSSO*	MSAP*	MSND*	MTNV*	MTCA*	MTCM*	MTCI*	MTRI*	MTRB*
X. sericea A. St.-Hil.																							
Xylosma cf. *benthamii* Triana & Planch.	r																						
Zanthoxylum caribaeum Lam.						r																	
Z. cinereum Lam.																							
Z. gardneri Engler																							
*Z. rhoifolium*Lam.						o																	
Z. riedelianum Engl.	o							r							o	r							
Zeyheria montana Mart.								r					r		r				r		o	o	
Annonaceae sp. (R8202)																							
Annonaceae sp. (R8222)																							
Chrysobalanaceae (R8289V)																							
Euphorbiaceae R7777																							
Lauraceae sp. (R8072)																							
Lauraceae sp. (R8267)																							
Lauraceae sp. (R7677)																a	o						
Lauraceae sp. (R8018)																							
Myrtaceae sp. (R7699)			o																				
Myrtaceae sp. (S2243)																							
Myrtaceae sp. (S2236)																							
Myurtaceae sp. (R8260)																							
Myrtaceae R7701																							
Myrtaceae S1127V																							
Myrtaceae S1126V																							
Myrtaceae S455																							
Myrtaceae Sueli 237			o																				
Myrtaceae Sueli 238			o																				
Myrtaceae Sueli 239			o																				
Myrtaceae sp. (R8226V)																							
Myrtaceae sp. (S2211)																							
Myrtaceae sp. (S2212)																							
Myrtaceae sp. (R8203)																							
Myrtaceae sp. (R8204)																							
Myrtaceae sp. (R8177V)																							
Myrtaceae sp. (R8178V)																							
Myrtaceae sp. (R8217)																							
Myrtaceae sp. (R8224)																							
Myrtaceae sp. (R8225)																							
Myrtaceae sp. (S2217)																							
Myrtaceae sp. (R8228)																							
Myrtaceae sp. (S2236)																							
Myrtaceae sp. (R8258V)																							
Myrtaceae sp. (R8276V)																							
Myrtaceae sp. (S2261)																							
Myrtaceae sp. (S2262)																							
Myrtaceae sp. (S2263)																							
Myrtaceae sp. (R7981A)																							
Myrtaceae sp. (R8017)																							
Myrtaceae sp. (R7847V)																							
Myrtaceae sp. (R7848V)																							

Continua ...

Tabela 2. Espécies encontradas nos 170 levantamentos rápidos realizados em Cerrado sentido amplo no Bioma Cerrado. Para ajustar a tabela, os levantamentos para as 576 espécies encontram-se agrupados em blocos de aproximadamente 25 localidades.(Continuação)

Espécies	Código das Localidades																							
	MTMC*	MTAL*	MTTA*	MTCN*	MTCR*	MTNA*	MTGE*	MTGC*	MTNX*	MTRC*	MTDR*	MTCD*	MTCE*	MTCB*	MTFC*	MTPR*	PICO*	PICR*	PIGI*	PIGL*	PISA*	ROCA*	ROPI*	ROMI*
Abarema cochliacarpos (Gomes) R.C. Barneby & J.W. Grimes																								
Abuta grandifolia (Mart.) Sandw.	r																							
A. selloana Eichler																								
Acacia paniculata Willd.																								
A plumosa Lowe																								
A. aff. polyphylla DC.																								
Acosmium dasycarpum (Vog.) Yakovlev	r		f	o	r	r		r			r		r	o		o	r	r	r		o			
A. nitens (Vog.) Yakovlev																								
A. subelegans (Mohl.) Yakovlev																								
Acrocomia aculeata (Jacq.) Lodd. ex Mart.														r										r
Aegiphila lhotskyana Cham.		c	r									r												
Agonandra brasiliensis Miers	r		r	f	r	o				o										r				r
Aiouea trinervis Meissn.											o	f												
Albizzia niopoides (Spruce ex Benth.) Burk.																								
Alchornea schomburgkii Klotzsch																								
Alibertia concolor (Cham.) K. Schum.																								
A. edulis (L. Rich.) A. Rich.	r	r	o	o			r			o			r	o								a	c	
A. elliptica (Cham.) K. Schum.				c					o	f														
A. obtusa Cham.					c	r	r			o			a	o							a			
A. sessilis (Cham.) K. Schum.	r											r					f					r		
A. verrucosa S. Moore													r											
Alibertia sp. (R7844V)							r														a			
Alibertia sp. (R7922)																								
Allophylus edulis Radlk. ex Warm.																								
Aloysia virgata Juss.																								
Amburana cearensis (Fr. Allem.) A.C.Sm.																								
Anacardium occidentale L.				o	r	o											r		f					
Anadenanthera colubrina (Vell.) Brenan *var.* cebil (Griseb.) Altschul													o							r				r
A. peregrina (Benth.) Speg.		o																						
Andira cordata Arroyo ex R. T. Pennington																			c					
A. cuiabensis Benth.	c	o		f	f	c	r	f	o	f					f	r								
A. vermifuga (Mart.) Benth.		o	f						r	r	r	r		r		o			c	r				
Annona aurantiaca Barb. Rodr.																								
A. coriacea Mart.		f	f	o	r	c	f	o	o	r		r	o		f	f	r		r		o			r
A. crassiflora Mart.		r	o	o	o	r		o		f		r				r			c					
A. dioca A . St.-Hil.							f																	
A. tomentosa R.E. Fr.																								
Annona sp. (R8012)																								
Antonia ovata Pohl				c	r	r			o													r		f

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MTMC*	MTAL*	MTTA*	MTCN*	MTCR*	MTNA*	MTGE*	MTGC*	MTNX*	MTRC*	MTDR*	MTCD*	MTCE*	MTCB*	MTFC*	MTPR*	PICO*	PICR*	PIGI*	PIGL*	PISA*	ROCA*	ROPI*	ROMI*
Cheiloclinium cognatum (Miers) A. C. Sm.																								r
Chiococcoa alba Hitchc.																								
Chomelia obtusa Cham. & Schltdl.																								
C. pohliana Müll. Arg.																								
C. ribesioides Benth.																								
Chrysophyllum arenarium Fr. Allem																								
C. marginatum Radlk.																								
C. rufum Mart.																								
Chrysophyllum sp. (S554)																								
*Chrysophylum*sp. (R7614)																								
Clusia sellowii Schltdl.																								
Coccoloba brasiliensis Nees & Mart.																								
C. mollis Casar.				o																	r			
Cochlospermum orinocense Steud.																								
C. regium (Schrank) Pilg.																	r				r	f	c	o
C. vitifolium (Willd.) Spreng.																	c							
Combretum duarteanum Cambess.																		f	r					
C. mellifluum Eich.																								
Connarus suberosus Planch.	r	o	f		f	f	o	r	o	f	o	o		r	o	c	r	o	f	o				
Copaifera langsdorfii Desf.			r	o				r	f												f		r	
C. martii Hayne	o		r	c		c			f	f			o	r										
Cordia alliodora (Ruiz & Pav.) Oken																								
C. anabaptista Cham.																								
C. glabrata (Mart.) A. DC.																	f							
C. insignis Cham.				r																				
C. sellowiana Cham.																					f			
C. trichotoma (Vell.) Arrab.																								
Cordia sp. (R7973V)																								
Couepia grandiflora (Mart. & Zucc.) Benth.	o		f		r	o	o	o	o		r				o	o				r				
Coussarea hydrangeaefolia Benth. & Hook.				o																	f			.r
Croton urucurana Baill.																								
Croton sp. (R8122)																								
Cupania rugosa Radlk.																								f
C. vernalis Cambess.																								
Curatella americana L.	r		o	c	r	o	o	o	f	c			c	c		o	f		f		c	a	a	c
Cybianthus detergens Mart.				r						r					r									
Cybistax antisyphilitica Mart.				r		r				r							r		r		r			
*Dalbergia cuiabensis*Benth.																								
D. glandulosa Benth.				o																				
D. miscolobium Benth.		r	o		r					r								r	o					
Davilla elliptica A. St.-Hil.		o	o	c	f	c	o	c	c	o	a	o		r	a			f	r	o				r
Desmoncus orthocanthos Mart.																								
Didymopanax distractiflorum Harms		o	f							r	o	r				f								f
D. gardnerianum Tul.																								
D. macrocarpum (Cham. & Schltdl.) Seem.			o													f								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MTMC*	MTAL*	MTTA*	MTCN*	MTCR*	MTNA*	MTGE*	MTGC*	MTNX*	MTRC*	MTDR*	MTCD*	MTCE*	MTCB*	MTFC*	MTPR*	PICO*	PICR*	PIGI*	PIGL*	PISA*	ROCA*	ROPI*	ROMI*
D. morototoni Decne. & Planch.													c											
D. vinosum (Cham. & Schltdl.) March.																				o				
Didymopanax sp. (S1092)																								
Didymopanax sp. (R8142V)																								
Didymopanax sp. (RS1004)																								
Dilodendron bipinnatum Radlk.																								
Dimorphandra mollis Benth.	o		o	f	o	o	r	r	r	o	r			f	c	f		r	r	r	o			
Diospyros burchellii Hiern														r	a	f								
D. hispida DC.	r	f		r	f	c	f	c	r	r	r		r					f	f					
Diospyros sericea DC.				r																				
Diospyros sp. (R7953V)																								
Dipteryx alata Vogel	o			o		r	r		o				a	a										
Diptychandra aurantiaca (Mart.) Tul.		r	o																					
Doliocarpus dentatus (Aubl.) Standl. Ssp. Dentatus																								
Duguetia furfuracea (A. St.-Hil.) Benth. & Hook.	r	f		r	o	f		f	f	o	r			o	f	c								
D. glabriuscula R. E. Fries								f																
D. lanceolata A. St.-Hil.																								
D. margraviana Mart.																			r					
Emmotum nitens (Benth.) Miers	r	c	r	r		r	c	c	c	c		f								r				
Enterolobium contortisiliquum (Vell.) Morong																								
E. gummiferum (Mart.) J. Macbr.									r	o				r	r									
Ephederanthus parviflorus S. Moore																								
Eremanthus glomerulatus Less.																								
E. goyazensis Sch. Bip.			r																					
E. mattogrossensis Kuntze																								
E. rondoniensis MacLeish & Schumacher																								
Eriotheca gracilipes (Schum.) Robyns		f	r	f	o	r	o	o	c	f	o	o		o	o	f								
E. parvifolia (Mart. & Zucc.) A. Robyns																								
E. pubescens (Mart. & Zucc.) Schott. & Endl.										r														
Eriotheca sp. (R7863V)																								
Erythroxylum cf. anguifugum Mart.																								
E. betulaceum Mart.																								
E. campestre A.St.-Hil.																								
E. cuneifolium Poepp. ex O.E. Schulz																								
E. daphnites Mart.	r			c			r					r	r											
E. deciduum A. St.-Hil.															o	o			o					
E. engleri O . E. Schulz						r																		
E. pruinosum O. E. Schulz																								
E. suberosum A. St.-Hil.	r	o	r	r	r	f	r							r		r					o			
E. tortuosum Mart.		o		r	r	f																		
Erythroxylum sp. (S1006)																								
Erythroxylum sp. (R7600)																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MTMC'	MTAL'	MTTA'	MTCN'	MTCR'	MTNA'	MTGE'	MTGC'	MTNX'	MTRC'	MTDR'	MTCD'	MTCE'	MTCB'	MTFC'	MTPR'	PICO'	PICR'	PIGI'	PIGL'	PISA'	ROCA'	ROPI'	ROMI'
Erythroxylum sp. (R7870)																								
Erythroxylum sp. (R7870V)																								
Eschweilera nana (Berg) Miers			r					f	r			r						c	c	o		r		
E. aurata O. Berg																					r			
E. biflora DC.																								
E. chrysantha O. Berg					o	o																		
E. dysenterica DC.	o			o	r	r				c			c				a		c		c			
E. florida DC.																								
E. cf. *gemmiflora* O. Berg						o																		
E. pumila Pohl																								
E. punicifolia (Kunth) DC.																								
Eugenia sp. (R7873)																								
Eugenia sp. (R7944)																								
Eugenia sp. (R7959)																								
Eupatorium squalidum DC.																								
Euplassa inaequalis (Pohl) Engl.	r			r	r	o	r		f	c				o										
Ferdinandusa elliptica Pohl				c	r	o					c	o												r
Genipa americana L.																								
Guapira opposita (Vell.) Reitz.																								
Guazuma ulmifolia Lam.													o											r
Guettarda viburnioides Cham. & Schltdl.				r									r								r		r	
Hancornia. speciosa Gomez		o	r		r	o	r				r	r		r	r	r		r		r				
Heisteria ovata Benth.				r						r														
Heisteria sp. (S553)																								
Helicteres lhotskyana K. Schum.																								
Helicteres brevispira A. Juss.																								r
H. macropelata A . Juss.																								
Heteropterys byrsonimifolia A. Juss.	r			c		o								f										
Himatanthus articulatus (Vahl) Woodson																								
H. obovatus (Müll. Arg.) Woodson	r	r	o	f	o	o	r		f	o	o	r	r	f	o	o		f	r	f		o		r
H. sucuuba (Spruce ex Mull. Arg.) R.E. Woodson																								
Hirtella ciliata Mart. ex Zucc.				o	r		c												c	a				
H. burchellii Britton																								
H. glandulosa Spreng.			r						o	f														
H. gracilipes (Hooker f.) Prance	o									r														
Hymenaea courbaril L. var. *stilbocarpa* (Hayne) Lee & Lang.				r									r										r	
H. eriogyne Benth.																								
H. stigonocarpa Mart. ex Hayne	c	o	f	f	o	o	r	f	a	f	r	r	o	r	r	o	r	f	f	r	f			
Hyptidendron canum (Pohl ex Benth.) Harley			r																					
Inga cf. *affinis* DC.																								
I. alba Willd.																								
Inga sp. (R7550)																								
Jacaranda brasiliana Pers.																					r			
J. caroba (Vell.) DC.																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MTMC'	MTAL'	MTTA'	MTCN'	MTCR'	MTNA'	MTGE'	MTGC'	MTNX'	MTRC'	MTDR'	MTCD'	MTCE'	MTCB'	MTFC'	MTPR'	PICO'	PICR'	PIGI'	PIGL'	PISA'	ROCA'	ROPI'	ROMI'
J. cuspidifolia Mart.				r																				r
J. macrantha Cham.																								
J. rufa Silva Manso																								
Jatropha vitifolia Mill.									f															
Kielmeyera coriacea (Spreng.) Mart.		f	c				o	r		o		r	r			r	r		r	r	o			r
K. lathrophyton Saddi																								
K. rubriflora A. St.-Hil.				o	o	o		o																
K. speciosa A. St.-Hil.				f								r		r										
Kielmeyera sp. (R7954)																								
Lacistema aggregatum (Berg) Rusby																								
L. gardneri Kuntze																								
Laoensia pacari A. St.-Hil.	r		r	f	r	f	r	r	o	r			o		r	r	o	o	o	r	o			
Licania gardneri Kuntze				o		f		r																
L. humilis Cham. & Schltdl.											a	o			f	c								
L. octandra (Hoffm. ex Roem & Schult.) Kuntze																								
L. sclerophylla Mart.ex Hook.f.									o	r												r		
*Licania*sp. (S1082)																								
Licania sp. (R7601)																								
Linociera hassleriana (Chodat) Hassler																								
Lithraea molleoides (Vell.) Engl.																								
Ludwigia nenosa (Poir.) Ham.																								
Luehea candicans Mart.																							r	
L. grandiflora Mart.																								
L. paniculata Mart.													c				f				o		r	
L. speciosa Willd.													f											
Luetzelburgia auriculata (Allem.) Ducke																								
L. praecox Harms.	o			f						r			o											
Mabea fistulifera Mart.																								
Macairea radula DC.																								
Machaerium aculeatum Raddi																								
M. acutifolium Vogel	o	o	r	r	r	r	r	o		o			r	f	r	r			o		o			
M. angustifolium Mart. ex Benth.														r										
M. hirtum (Vell.) Stellfeld																							r	
M. opacum Vogel											r					r	o	o						
M. scleroxylon Tul.																	r							
Machaerium sp. (R8024Va)																								
Maclura tinctoria (L.) Don ex Steud.																								
Magonia pubescens A. St.-Hil.				f		r	r		o				a				c		o		o			r
Maprounea guianensis Aubl.			o	r						r	r	a						r						
Martiodendron parviflorum Amshoff.																								
Matayba guianensis Aubl.				o					f	o	o			o		r								
M. illicifolius Mart. ex Reissek																					r	r		
Maytenus sp. (R7833)					r																			
Mezilaurus crassiramea (Meissn.) Taub.					o	o	o	o	a	f	c						o							
M. itauba (Meissn.) Taubert																								
Miconia albicans (Sw.) Triana		c			f		a	c		f	c	c							r			f		
M. burchellii Triana			f																					

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MTMC	MTAL	MTTA	MTCN	MTCR	MTNA	MTGE	MTGC	MTNX	MTRC	MTDR	MTCD	MTCE	MTCB	MTFC	MTPR	PICO	PICR	PIGI	PIGL	PISA	ROCA	ROPI	ROMI
M. fallax DC.																								
M. ferruginata DC.			f												r	r								
*M. holosericea*Triana												o												
M. macrothyrsa Benth.										r														
M. pyrifolia Naud.											a	f												
M. rubiginosa (Bonpl.) DC.																		•						
M. sellowiana Naud.									o			r												
M. stenostachya DC.																								
Miconia sp. (R7806)																						f		o
Miconia sp. (Sueli 244)																								
Miconia sp. (R8199)															o									
Miconia sp. (S2231)																								
Miconia sp. (S2232)																								
Miconia sp. (S2258)																								
Mimosa clausennii Benth.									r															
M. exalbenses Barneby																								
M. hebecarpa Benth.																								
M. laticifera Rizzini & Mattos																								
M. pteridifolia Benth.																								
M. sericantha Benth.																								
Mimosa sp. (S552)																								
Mimosa sp. (R7635V)																								
Micropholis gardneriana																								
(A. DC.) Pierre												r												
Mollia burchelliiSprague																								
Monnina martiana Klotzsch																								
ex A. W. Benn.	o	c	f		o	f		a		c	o				f	f		a	o	c			
Mouriri elliptica Mart.					f	f		f		r									o	a				
M. pusa Gardner			f						o															
Myrcia albo-tomentosa Cambess.																								
M. canescens O. Berg		f																						
M. camapuanensis N. J. E. Silveira		o																						
M. decrescens O. Berg																								
M. gardneriana O. Berg				f		a	o		r	r									o					
M. lanuginosa O. Berg																								
M. cf. lasiopus DC.				f		r			r	r														
M. lingua (O. Berg) Mattos																								
M. mutabilis O. Berg						r																		
M. pallens DC.				r	a	o																		
M. cf. regneliana O . Berg									r															
M. rorida Kiaersk.										c														
M. rostrata DC.										c		a												
M. schottiana O. Berg																								
M. sellowiana O. Berg																								
M. splendens (Sw.) DC.																								
M. cf. stictosepala Kiaersk.																								
M. tomentosa (Aubl.) DC.																								
M. uberavensis O. Berg																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MTMC*	MTAL*	MTTA*	MTCN*	MTCR*	MTNA*	MTGE*	MTGC*	MTNX*	MTRC*	MTDR*	MTCD*	MTCE*	MTCB*	MTFC*	MTPR*	PICO*	PICR*	PIGI*	PIGL*	PISA*	ROCA*	ROPI*	ROMI*
Myrcia sp. (R7695V)																								
Myrcia (R7516V)																								
*Myrcia*sp. (R8204)																							f	
Myrcia sp. (S2216)																								f
Myrcia sp. (S2233)																								
Myrcia sp. (Sueli 241)																								
Myrcia sp. (Sueli 276)																								
Myrcia sp. (Sueli 275)																								
Myrcia sp. (R8239)																								
Myrcia sp. (R7874V)																								
Myrcia sp. (R7890)																								
Myrcia sp. (R7893)																								
Myrcia sp. (R8239)																								
Myrcia sp. (R8262V)											c													
Myrcia sp. (S2211)												r												
Myrcia sp. (S2213)												f												
Myrcia sp. (S2248)												r	o	.										
Myrcia sp. (R7890)																								
Myrcia sp. (R7944V)																								
Myrcia sp. (R7927V)																								
Myrcia sp. (R8159V)																								
Myrcia sp. (R8160)																								
Myrcia sp. (R8288)																								
Myrcia sp. (S2350)																								
Nectandra cf. *cuspidata* Nees & Mart.																								
Neea theifera Oerst.			r	r	r				r															
Neea sp. (R7580)																								
Norantea adamantina Cambess.																								
N. goyazensis Cambess.			f																					
Ocotea minarum Nees Mez.																								
O. suaveolens Hassl.																								
Ocotea sp. (R7775)																								
Ocotea sp. (R8283)															o									
Ouratea castaneaefolia Engl.	o			r																			o	
O. floribunda Engl.																								
O. hexasperma (A. St.-Hil.) Benth.		f		r	r	f		r	f	r	o				o	f			r			o		r
O. spectabilis (Mart.) Endl.		r	o		o	r	r	o	c	f	c	o				o								
Ouratea sp. (S2349)																								
Oxandra sessiliflora R.E. Fries																								
Palicourea rigida Kunth		r				r				r	o	r	r	r	r	o								
Parkia platycephala Benth.																			o					
Peltogyne confertiflora (Hayne) Benth.						r				r														
Pera glabrata (Schott.) Baill.																								f
Peritassa campestris (Cambess.) A.C.				c				r																
Persea pyrifolia Nees & Mart. ex Nees																								
Physocalyma scaberrimum Pohl	o			r			r			r												a		f
Piper aduncum L.																								o
Piptadenia gonoacantha (Mart.) Macbride																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MTMC¹	MTAL²	MTTA³	MTCN⁴	MTCR⁵	MTNA⁶	MTGE⁷	MTGC⁸	MTNX⁹	MTRC¹⁰	MTDR¹¹	MTCD¹²	MTCE¹³	MTCB¹⁴	MTFC¹⁵	MTPR¹⁶	PICO¹⁷	PICR¹⁸	PIGI¹⁹	PIGL²⁰	PISA²¹	ROCA²²	ROPI²³	ROMI²⁴
Pithecelobium moniliformis Benth.																									
Piptocarpha rotundifolia (Less.) Baker		c	f		r		f	f			f	f		r	o	o									
Pisonia graciliflora Mart.				o	r	r																			
P. noxia Netto var. *noxia*			f	o	r	r																			
P. noxia var.*psammophila* Mart. ex J. A. Schmidt.		f									f			o	o	o									
Pisonia opposita (Vell.) Reitz.																									
Pisonia sp. (R7842)							r																		
Pisonia sp. (R8293V)																									
Plathymenia reticulata Benth.			f	o	o	o		r	o		o				r	r			r	r					r
Platonia insignis Mart.																									
Platycyamus regnelli Benth.																									
Platypodium elegans Vogel																									r
Playmiscium floribundum Vogel													r												
Pouteria ramiflora (Mart.) Radlk.	f	f	o	r	f	a	f	o	r	o	o	f		c	c	a		f	f	c					
P. torta (Mart.) Radlk.		f	r								c	r			r	f		r	f	o					
Protium heptaphyllum (Aubl.) E. K. Marchal	o			c		r	r		o	r			r												r
P. ovatum Engl.											o	o	f		r										
Pseudobombax longiflorum (Mart. & Zucc.) Robyns	r	r	r	f	r	r	r			r			r									c	o		r
P. marginatum (A. St.-Hil., A. Juss. & Cambess.) Robyns				r																	r				f
P. tomentosum (Mart. & Zucc.) Robyns													o												
Psidium cinereum Mart. ex DC.																									
P. guianense Sw.																									
P. myrsinoides O. Berg				o									o						o		o	r			
P. pohliana O. Berg																									
P. warmingianum Kiaersk.																									
Psidium sp. (S1074)																									
Psidium sp. (R8096)																									
Pterodon polygalaeflora Benth.																		f	o	r					
P. pubenscens Benth.	o/f		o		r	r	c	c	o	r	o	o		r											
Qualea dichotoma (Mart.) Warm.																									
Q. grandiflora Mart.	o	c	f	o	f	f	c	f	c	o	o	r	c	o	c	f	r	o	o		o				r
Q. multiflora Mart.	o	f	c	f	o	c	f	r	c	o	r	r		r	r						r				
Q. parviflora Mart.	r	c	c	f	f	c	c	r	c	o	f	o	c		r	r	o	a	o	c	o	r			r
Rapanea ferruginea Spreng.																									
R. guianensis Kuntze													a												a
R. umbellata Mart.																									
Remijia amazonica K. Schum.																									
Rhamnidium elaeocarpum Reissek													r												
Richeria grandis Vahl																									
Rollinia cf. *mucosa* (Jacq.) Baill.																									
R. silvatica A . St.-Hil.																									
Roupala montana Aubl.	r	o	f	f	c	c	f	c	f	a		c			o	o									r
Rourea induta Planch.		f	o	f	f	o		o	f	c	c				o	o		r		r					
Rudgea burchelliana Mull. Arg.																									
R. viburnioides (Cham.) Benth.			f										r	f								r			r

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	MTMC'	MTAL'	MTTA'	MTCN'	MTCR'	MTNA'	MTGE'	MTGC'	MTNX'	MTRC'	MTDR'	MTCD'	MTCE'	MTCB'	MTFC'	MTPR'	PICO'	PICR'	PIGI'	PIGL'	PISA'	ROCA'	ROPI'	ROMI'
Salacia crassifolia (Mart.) Peyr.		r		r		c			o	o	a	f		r	o	c								
S. elliptica G.Don					f								r								r			
Salacia sp. (R7633V)																								
Salacia sp. (S2246)																								
Salvertia convallariodora A. St.-Hil.			r	r	r	o	o			r	c	o			r	o		c	f	f				r
Sapium longifolium (Müll. Arg.) Huber																								
S. cf. obovatum Klotzsch ex Mull. Arg.																								
S. cf. petiolare (Mull. Arg.) Huber																								
Sapium sp. (S1090)																								
Schinopsis brasiliensis Engl.																								
Schinus longifolius (Lindl.) Speg. var. paraguariensis (Hassler) Barkl.																								
Sclerolobium aureum (Tul.) Benth.	r	r		c	o	c	f	o	o	r			o		o	o		r	o		o			r
S. paniculatum Vogel		a	c		r		f	c	f	a	o	o			f			o	o	a		a		
Sebastiana brasiliensis Spreng.																								
Senna macranthera (DC. ex Coll.) Irwin & Barneby																								
S. silvestris (Vell.) Irwin & Barneby	o																							
S. spectabilis (DC.) Irwin & Barneby																								
S. velutina (Vogel) H.S. Irwin & R.C. Barneby																								
Simaba blanchetii Turcz.																								
Simarouba versicolor A. St.-Hil.		c	c	f	o	o	c	o	o	r			o	r	r	o	f		f		o	f	r	
Simira rubescens (Bent.) Bremk. ex Steyermark																								
Siparuna guianensis Aubl.							o			r									r			o		r
Siphoneugena densiflora O. Berg								r																
Solanum crinitum Lam.																								
S. lycocarpum St. Hil.											r													
Solanum sp. (Rosanna 144)																								
Sorocea guilleminiana Gaudich.																								
Spiranthera odoratissima A . St-Hil.																								
Spondias mombin L.																								
Sterculia striata A. St.-Hil. & Naud.													r											
Strychnos pseudoquina A. St.-Hil.			c	r	r	o			o	r					r	o				r				
Stryphnodendron adstringens (Mart.) Cov.											c				f	c								
S. coriaceum Benth.		r								r														
S. obovatum Benth.				r	r	o	o	f	o	r		r		c	o	o				o	o	r		
Styrax ambiguus Seubert																								
S. camporum Pohl																								
S. ferrugineus Nees & Mart.			o							r					o	a				r				
Swartzia sp.(S1032)																								
Syagrus comosa (Mart.) Mart.	r		o	o	o	r			o		r	r						r						
S. flexuosa (Mart.) Becc.	r			o	f	o																		
S. oleracea (Mart.) Becc.																								
Symplocos nitens (Pohl.) Benth.																								
Tabebuia aurea (Manso) Bentham & Hook.f. ex S. Moore	o	f	o	r	r	o			o	r			f	r	r	o	o		o		r	f	r	

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	MTMC'	MTAL'	MTTA'	MTCN'	MTCR'	MTNA'	MTGE'	MTGC'	MTNX'	MTRC'	MTDR'	MTCD'	MTCE'	MTCB'	MTFC'	MTPR'	PICO'	PICR'	PIGI'	PIGL'	PISA'	ROCA'	ROPI'	ROMI'
T. impetiginosa (Mart.) Standl.				r									r											
T. ochracea (Cham.) Standl.	r		o		r	r	r	o		r		r	r	r			r	r	r	o				
T. roseoalba (Ridley) Sandw.													r											r
T. serratifolia (Vahl.) Nich.														r										r
Tapirira guianensis Aubl.							f							r									r	a
Tapura amazonica Poepp. & Endl.																								
Terminalia argentea Mart. & Zucc.				f			r		r	r			a											c
T. fagifolia Mart. & Zucc.																	r		c	f				
T. glabrescens Mart.																								
T. phaeocarpa Eichl.																								
Tetragastis balsamifera (Swartz) O.K.																								
T. unifoliolata (Engl.) Cuatrec.																								
Tibouchina candolleana Cogn.																								
Tocoyena brasiliensis Mart.																								
T. formosa (Cham. & Schltdl.) Schum.	r		r	r	r	r							r			r	o	o		r	r			
Tomelea brachypoda Miers							r																	
Toulicia crassifolia Radlk.																								
T. tomentosa Radlk.									r	o														
Trattinickia rhoifolia Willd.																								
Trema micrantha Blume																								
Trichilia catigua C. DC.																								
T. elegans A. Juss.																								
T. pallida Sw.																								
Unonopsis sp. (S2250)													r											
Vanillosmopsis. pohlii Baker																								
Vatairea macrocarpa (Benth.) Ducke	f			c	o	a	c	c	f		o	r	r	r	r	r	r	r						o
Vellozia squamata Pohl	r																							
Vernonia ferruginea Less.			r	r						r			o								r	r	r	f
Virola sebifera Aubl.				r			r			r												o		r
V. subsessilis Warb.																								
Vismia glaziovii Rouhl.											f	o										a	c	
V. decipiens Cham. & Schltdl.																								
V. guianensis (Aubl.) Choisy																								
Vismia sp. (S1072)																								
Vismia sp. (R7843)							c																	
Vitex cymosa Bert.ex Spreng.																					r			
V. panshiniana Moldencke																								
V. polygama Cham.				r						r														
V. regnelliana Moldencke																								
Vitex sp. (S1032)																								
Vochysia cinnamomea Pohl																								
V. elliptica (C. K. Spreng.) Mart.																								
V. gardneri Warm.																		c	o	o				
V. haenkeana Mart.			r						r			r		r										r
V. rufa (C. K. Spreng.) Mart.		f	o	r	c	c	f	f		o	f	f			c	c								
V. thyrsoidea Pohl																								
V. tucanorum (C.K. Spreng.) Mart.										r														
Ximenia americana L.																							r	
Xylopia aromatica Lam.	o		c	f	f		a	f	o	c		o				o						f		o

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																									
	MTMC*	MTAL*	MTTA*	MTCN*	MTCR*	MTNA*	MTGE*	MTGC*	MTNX*	MTRC*	MTDR*	MTCD*	MTCE*	MTCB*	MTFC*	MTPR*	PICO*	PICR*	PIGI*	PIGL*	PISA*	ROCA*	ROPI*	ROMI*
X. sericea A. St.-Hil.										f														
Xylosma cf. *benthamii* Triana & Planch																								
Zanthoxylum caribaeum Lam.																								
Z. cinereum Lam.																								
Z. gardneri Engler																								
*Z. rhoifolium*Lam.																								
Z. riedelianum Engl.													o											
Zeyheria montana Mart.						r				f				o	r	o		r	r	r				
Annonaceae sp. (R8202)																							r	r
Annonaceae sp. (R8222)																								
Chrysobalanaceae (R8289V)																								
Euphorbiaceae R7777																								
Lauraceae sp. (R8072)																								
Lauraceae sp. (R8267)																								
Lauraceae sp. (R7677)																								
Lauraceae sp. (R8018)																								
Myrtaceae sp. (R7699)																								
Myrtaceae sp. (S2243)																								
Myrtaceae sp. (S2236)																								
Myurtaceae sp. (R8260)																								
Myrtaceae R7701																								
Myrtaceae S1127V																								
Myrtaceae S1126V																								
Myrtaceae S455																								
Myrtaceae Sueli 237																								
Myrtaceae Sueli 238																								
Myrtaceae Sueli 239																								
Myrtaceae sp. (R8226V)																								
Myrtaceae sp. (S2211)																						f	r	r
Myrtaceae sp. (S2212)																							r	
Myrtaceae sp. (R8203)																							r	
Myrtaceae sp. (R8204)																							r	
Myrtaceae sp. (R8177V)																								
Myrtaceae sp. (R8178V)																								
Myrtaceae sp. (R8217)																								
Myrtaceae sp. (R8224)																								
Myrtaceae sp. (R8225)																								
Myrtaceae sp. (S2217)																								r
Myrtaceae sp. (R8228)																								
Myrtaceae sp. (S2236)																								
Myrtaceae sp. (R8258V)														f										
Myrtaceae sp. (R8276V)														f										
Myrtaceae sp. (S2261)															f	a								
Myrtaceae sp. (S2262)															f	a								
Myrtaceae sp. (S2263)															r	o								
Myrtaceae sp. (R7981A)																								
Myrtaceae sp. (R8017)																								
Myrtaceae sp. (R7847V)							o																	
Myrtaceae sp. (R7848V)							f																	

Continua ...

Tabela 2. Espécies encontradas nos 170 levantamentos rápidos realizados em Cerrado sentido amplo no Bioma Cerrado. Para ajustar a tabela, os levantamentos para as 576 espécies encontram-se agrupados em blocos de aproximadamente 25 localidades.(Continuação)

Espécies	Código das Localidades																							
	ROES*	ROQU*	ROPE*	ROPO*	ROPM*	ROCO*	ROVI*	TODA*	TOLJ*	TOPL*	TOTA*	TOPO*	TOPN*	TOMO*	TOMC*	TOCA*	TODI*	TOLA*	TOCR*	TOPA*	TOBA*	TOPU*	TONA*	TONI*
Abarema cochliacarpos (Gomes) R.C. Barneby & J.W. Grimes																								
Abuta grandifolia (Mart.) Sandw.	f		r																					
A. selloana Eichler																								
Acacia paniculata Willd.																								
A plumosa Lowe																								
A. aff. *polyphylla* DC.							r		r	r	r	f	o	r	o	r					o	r	r	r
Acosmium dasycarpum (Vog.) Yakovlev																								
A. nitens (Vog.) Yakovlev								o					r			r		f			o			o
A. subelegans (Mohl.) Yakovlev							r	r	r							r			r	r	o			
Acrocomia aculeata (Jacq.) Lodd. ex Mart.									c	o		r	f		r			r						
Aegiphila lhotskyana Cham.			r					a										r						
Agonandra brasiliensis Miers													r						c	o				
Aiouea trinervis Meissn.																								
Albizzia niopoides (Spruce ex Benth.) Burk.								a					r				r	r						
Alchornea schomburgkii Klotzsch																								
Alibertia concolor (Cham.) K. Schum.		c	f	o		o		r		o	f		f		c				r	r	o		o	o
A. edulis (L. Rich.) A. Rich.																								
A. elliptica (Cham.) K. Schum.	o		r					r			f			r				r				r	o	
A. obtusa Cham.				r		o	o																	
A. sessilis (Cham.) K. Schum.											r									o				
A. verrucosa S. Moore																								
Alibertia sp. (R7844V)																								
Alibertia sp. (R7922)																								
Allophylus edulis Radlk. ex Warm.																								
Aloysia virgata Juss.	r																							
Amburana cearensis (Fr. Allem.) A.C.Sm.							r	c	o	o	o	o	o	f	o		r	r	o	o	o	r	o	o
Anacardium occidentale L.	r																	c						
Anadenanthera colubrina (Vell.) Brenan var. cebil (Griseb.) Altschul																								
A. peregrina (Benth.) Speg.																								
Andira cordata Arroyo ex R.T. Pennington								r	f						r	o	a		a	r	r	o		r
A. cuiabensis Benth.						o	r	c	c		o	o	o	f	c	f		r			r	r		r
A. vermifuga (Mart.) Benth.																								
Annona aurantiaca Barb. Rodr.		r			r	r	r	f	r	o	o	r	o		o			r	r	r	r	o	o	
A. coriacea Mart.									r							r				r		r		
A. crassiflora Mart.									r															
A. dioca A . St.-Hil.									r															
A. tomentosa R.E. Fr.																								
Annona sp. (R8012)		a	o								r							o			r		r	r
Antonia ovata Pohl																						r		
Apeiba tibourbou Aubl.								o												r	r			
Apuleia leiocarpa J. Macbr.						r																	r	
Aspidosperma cylindrocarpum Müll. Arg.					o	o													r					
A. macrocarpon Mart.																								
A. multiflorum A. DC.								o			o	o	o	r	o	o			r	o	o	r	r	r
A. nobile Müll. Arg.																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	ROES*	ROQU*	ROPE*	ROPO*	ROPM*	ROCO*	ROVI*	TODA*	TOLJ*	TOPL*	TOTA*	TOPO*	TOPN*	TOMO*	TOMC*	TOCA*	TODI*	TOLA*	TOCR*	TOPA*	TOBA*	TOPU*	TONA*	TONT*
A. parvifolium A. DC.																								
A. subincanum Mart.								r							o			r						
A. tomentosum Mart.								r															r	r
Astrocaryum aculeatum G. Mey			f	a																				
A. vulgare Mart.																								
Astronium fraxinifolium Schott	c	f	o	r				a		f	o		r	a	c	r		a		c	c	f	r	c
A. urundeuva Fr. Allem.	f		f															a		r		e		r
Attalea humilis Mart.																								
A. phalerata Mart.																								
A. speciosa Mart. ex Spreng.								o			r													
Austroplenckia populnea (Reissek) Lundell																								
Baccharis dracunculifolia DC.																								
Banisteriopsis latifolia (A. Juss.) Cuatrec.								r						c										
Banisteriopsis sp. (S755)																								
Bauhinia bongardii Steud.																								
B. cupulata Benth.																								
B. dubia G. Don.																								
B. mollis Walp.																								
B. pulchella Benth.																								
B. rufa (Bong.) Steud.		c	o							r														
B. ungulata L.																								
*Bauhinia*sp. (R7515V)																								
Bauhinia sp. (R7558)																								
Bauhinia sp. (R7559)																								
Bauhinia sp. (S759)																								
Blepharocalyx salicifolius (Kunth) O. Berg																								
Borojoa lanceolata (Cham.) Cuatrec.																								
Bowdichia virgilioides Kunth		c	r		r	r	r	f	o			r	o	o	o		f		o	o		f	o	o	o
Bredemeyera brevifolia Klotzsch ex A.W. Benn.																								
B. floribunda Willd.	c		o		r			r																r	
Brosimum gaudichaudii Trécul							r	o	r			r	r		r	r	r		o	r	o		r		r
Buchenavia tetraphylla (Aubl.) R.A. Howard																									
B. tomentosa Eichler					r		r	c		o	o								r	r	o		r		o
Butia leiospatha (Mart.) Becc.																									
Byrsonima basiloba A. Juss.																									
B. coccolobifolia Kunth					o	r	f		o	f	f	r	o	o		f		r		o	o		o	o
B. correaefolia A. Juss.																									
B. crassa Nied.	r	c			r	r		f	o	f	o	f	o	f	c	o	r	o	r	o	o	o	f	o
B. crassifolia (L.) Kunth																	c							
B. gardnerana A. Juss.																								
B. inodorum S. Moore													r				r							
B. intermedia A. Juss.														r										
B. cf. oblongifolia A. Juss																								
B. sericea DC.					f	o	c																	
B. sessilifolia Benth.																								
B. stipulacea Adr. Juss.	o	c	o	a																				
B. vacciniaefolia A. Juss.																								
B. verbascifolia Rich. ex A. Juss.								o	o	o		o	o	o	f		r		r	r	o	o	o	r
Byrsonima sp. (R7742V)																								
Byrsonima sp. (R7756V)																								
Cabralea canjerana (Vell.) Mart.																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																									
	ROES'	ROQU'	ROPE'	ROPO'	ROPM'	ROCO'	ROVI'	TODA'	TOLJ'	TOPL'	TOTA'	TOPO'	TOPN'	TOMO'	TOMC'	TOCA'	TODI'	TOLA'	TOCR'	TOPA'	TOBA'	TOPU'	TONA'	TONT'
Caesalpinia bracteosa Tul.																								
Callisthene fasciculata (Spreng.) Mart.	c	a	a	r						a	r			r										
C. cf. *hassleri* Briq.																								
C. major Mart.									r															
C. minor(Mart)																							f	r
Callisthene cf. *mollissima* Warm.																								
Calophyllum brasiliense Cambess.																								
Calotropis procera Dryend.																								
Calycophyllum multiflorum Griseb.																								
Campomanesia eugenioides Blume																								
C. cf. *xanthocarpa* O. Berg																								
*Caraipa densiflora*Mart.								o																
Cardiopetalum calophyllum Schltdl.																								
Cariniana domestica Miers	r		o	a					o															
C. rubra Miers															r									
Caryocar brasiliense Cambess.					f	f	o	a	a		o	f	f	o	o	f	r	o	a	c				
C. coriaceum Wittm.																						f	o	o
Casearia arborea Urb.																								
C. grandiflora Cambess.																a							r	
C. javitensis Kunth	c																							
C. rupestris Eichler																		r						
C. sylvestris Sw.	r	o	r	r			r	o	o		o	o	o	f	o	r		r	o	o	c	o	o	o
Cecropia cyrtostachya Miq.																								
C. pachystachya Trécul		o		f											r		o	o						
Cedrella fissilis Vell.																								
Ceiba speciosa (A.St.-Hil.) Gibbs & Semir	r																							
Celtis pubescens (Kunth) Spreng.																								
Celtis sp. (R7548)																								
Cenostigma macrophyllum Tul.																								
Cenostigma sp. (S552)																								
Cereus jamacaru DC.																								
Chaetocarpus echinocarpus (Baill.) Ducke																								
Chamaecrista orbiculata (Benth.) Irwin & Barneby																								
Cheiloclinium cognatum (Miers) A. C. Sm.																								
Chiococcoa alba Hitchc.																		r						
Chomelia obtusa Cham. & Schltdl.		f				r																		
C. pohliana Müll. Arg.																								
C. ribesioides Benth.																								
Chrysophyllum arenarium Fr. Allem																								
C. marginatum Radlk.																								
C. rufum Mart.																								
Chrysophyllum sp. (S554)																								
*Chrysophylum*sp. (R7614)																								
Clusia sellowii Schltdl.																								
Coccoloba brasiliensis Nees & Mart.																								
C. mollis Casar.																		r				f		
Cochlospermum orinocense Steud.	c		c																					
C. regium (Schrank) Pilg.																								
C. vitifolium (Willd.) Spreng.		c																						
Combretum duarteanum Cambess.																								
C. mellifluum Eich.																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	ROES*	ROQU*	ROPE*	ROPO*	ROPM*	ROCO*	ROVI*	TODA*	TOLJ*	TOPL*	TOTA*	TOPO*	TOPN*	TOMO*	TOMC*	TOCA*	TODI*	TOLA*	TOCR*	TOPA*	TOBA*	TOPU*	TONA*	TONT*
Connarus suberosus Planch.					f	o	r	o	c	f	r	f	f	o	f	o	o	r	f	o	f	f	o	f
Copaifera langsdorfii Desf.	r	c	f	o					r		r			o	r	r		o			r			
C. martii Hayne								r	r															
Cordia alliodora (Ruiz & Pav.) Oken																								
C. anabaptista Cham.									r															
C. glabrata (Mart.) A. DC.																								
C. insignis Cham.																								
C. sellowiana Cham.																								
C. trichotoma (Vell.) Arrab.	o																							
Cordia sp. (R7973V)																								
Couepia grandiflora (Mart. & Zucc.) Benth.									r								r						r	o
Coussarea hydrangeaefolia Benth. & Hook.	r	r						r		r	r		r		f			f				r		r
Croton urucurana Baill.																								
Croton sp. (R8122)																								
Cupania rugosa Radlk.																								
C. vernalis Cambess.	r																	r						
Curatella americana L.	r	a	a	a				o	r	a	o	o	f	c	a	c	a	f	o	c	f	c	o	f
Cybianthus detergens Mart.																								
Cybistax antisyphilitica Mart.	r							r		r	r							r		r		r	r	o
*Dalbergia cuiabensis*Benth.																								
D. glandulosa Benth.																								
D. miscolobium Benth.													r	o					r	r				
Davilla elliptica A. St.-Hil.									r		o	f	o	o	o	c	o		r		r	r	o	
Desmoncus orthocanthos Mart.			r																					
Didymopanax distractiflorum Harms					c	o	f										r							
D. gardnerianum Tul.																								
D. macrocarpum (Cham. & Schltdl.) Seem.																								
D. morototoni Decne. & Planch.	o	o																						
D. vinosum (Cham. & Schltdl.) March.													r											
Didymopanax sp. (S1092)																								
Didymopanax sp. (R8142V)																								
Didymopanax sp. (RS1004)																								
Dilodendron bipinnatum Radlk.				r				r		r	o			r				r				c	r	
Dimorphandra mollis Benth.					o		r	o	o	o	r	f	r	o	o	f		r	o	f	o	f	f	o
Diospyros burchellii Hiern																								
D. hispida DC.							r	f	a	f	r	f	o	r	f	c	o	o	a	a	a	f	c	c
Diospyros sericea DC.								r						r				r					r	r
Diospyros sp. (R7953V)																								
Dipteryx alata Vogel	r							c			r			r						r		r		o
Diptychandra aurantiaca (Mart.) Tul.																								
Doliocarpus dentatus (Aubl.) Standl. Ssp. Dentatus				r																				
Duguetia furfuracea (A. St.-Hil.) Benth. & Hook.					r																			
D. glabriuscula R. E. Fries																								
D. lanceolata A. St.-Hil.																								
D. margraviana Mart.								r																
Emmotum nitens (Benth.) Miers	r				o	o	o	r			r		o	r	r	r	r	r	o	r	o	r	r	r
Enterolobium contortisiliquum (Vell.) Morong																								
E. gummiferum (Mart.) J. Macbr.								r	f			r		r		o		r	r	r		r	r	r
Ephederanthus parviflorus S. Moore									r															
Eremanthus glomerulatus Less.																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	ROES'	ROQU'	ROPE'	ROPO'	ROPM'	ROCO'	ROVI'	TODA'	TOLJ'	TOPL'	TOTA'	TOPO'	TOFN'	TOMO'	TOMC'	TOCA'	TODI'	TOLA'	TOCR'	TOPA'	TOBA'	TOPU'	TONA'	TONT'
E. goyazensis Sch. Bip.																								
E. mattogrossensis Kuntze																								
E. rondoniensis MacLeish & Schumacher					r	r																		
Eriotheca gracilipes (Schum.) Robyns	o	r			r	f	o	o	f		r	r	r		r			o		r	r		f	
E. parvifolia (Mart. & Zucc.) A. Robyns								o				o	o	r						r		r	r	r
E. pubescens (Mart. & Zucc.) Schott. & Endl.										o														
Eriotheca sp. (R7863V)															f									
Erythroxylum cf. anguifugum Mart.																								
E. betulaceum Mart.																								
E. campestre A.St.-Hil.																								
E. cuneifolium Poepp. ex O.E. Schulz																								
E. daphnites Mart.						f																		
E. deciduum A. St.-Hil.										o														
E. engleri O . E. Schulz																								
E. pruinosum O. E. Schulz												f	f	f	a	a	f		f	c	c	f	f	
E. suberosum A. St.-Hil.						r	r	f	o	f														
E. tortuosum Mart.											r	r		r	r	c			f				r	
Erythroxylum sp. (S1006)																								
Erythroxylum sp. (R7600)																								
Erythroxylum sp. (R7870)											r			r										
Erythroxylum sp. (R7870V)															o									
Eschweilera nana (Berg) Miers					r																			
E. aurata O. Berg																								
E. biflora DC.																								
E. chrysantha O. Berg																								
E. dysenterica DC.								o		f			r		o					r				c
E. florida DC.																								
E. cf. *gemmiflora* O. Berg																							o	
E. pumila Pohl																								
E. punicifolia (Kunth) DC.																								
Eugenia sp. (R7873)											r													
Eugenia sp. (R7944)																r								
Eugenia sp. (R7959)																								
Eupatorium squalidum DC.																								
Euplassa inaequalis (Pohl) Engl.													r											
Ferdinandusa elliptica Pohl						o	o						c	r	c	c			r					
Genipa americana L.																								
Guapira opposita (Vell.) Reitz.															o									
Guazuma ulmifolia Lam.	o									o								o				o	r	r
Guettarda viburnioides Cham. & Schltdl.	r	r									f			f				a		r		f		o
Hancornia. speciosa Gomez					f	r	o	o	r			o	r	r		r	r	r		r			r	f
Heisteria ovata Benth.						c	o																	
Heisteria sp. (S553)																								
Helicteres lhotskyana K. Schum.																								
Helicteres brevispira A. Juss.				r																				
H. macropelata A . Juss.																								
Heteropterys byrsonimifolia A. Juss.		o	r				r			r		c	f								r			
Himatanthus articulatus (Vahl) Woodson	o			o																				
H. obovatus (Müll. Arg.) Woodson					r	o	o	r	o		o	f	f	o	r	o		o	o	o	o		r	r
H. sucuuba (Spruce ex Mull. Arg.) R.E. Woodson																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	ROES*	ROQU*	ROPE*	ROPO*	ROPM*	ROCO*	ROVI*	TODA*	TOLI*	TOPI*	TOTA*	TOPO*	TOPN*	TOMO*	TOMC*	TOCA*	TODI*	TOLA*	TOCR*	TOPA*	TOBA*	TOPU*	TONA*	TONT*
Hirtella ciliata Mart. ex Zucc.									a				f							r				
H. burchellii Britton	r																							
H. glandulosa Spreng.											r		r	r	r	r	r		r	r		r		
H. gracilipes (Hooker f.) Prance			r																					
Hymenaea courbaril L. var. *stilbocarpa* (Hayne) Lee & Lang.			r				r	r						r				r		r		o	r	r
H. eriogyne Benth.																								
H. stigonocarpa Mart. ex Hayne							o	o				r	r							o		r		r
Hyptidendron canum (Pohl ex Benth.) Harley																								
Inga cf. *affinis* DC.																								
I. alba Willd.																								
Inga sp. (R7550)																								
Jacaranda brasiliana Pers.							r			o	f		r	o										r
J. caroba (Vell.) DC.																								
J. cuspidifolia Mart.	r		r																			r		
J. macrantha Cham.																								
J. rufa Silva Manso					r																			
Jatropha vitifolia Mill.																						f		
Kielmeyera coriacea (Spreng.) Mart.	r				r	r		r	o			f	o	o		o		r	f	o		o	r	o
K. lathrophyton Saddi									r			f		f					r	r	r	r		
K. rubriflora A. St.-Hil.																								
K. speciosa A. St.-Hil.					r	r	r																	
Kielmeyera sp. (R7954)																			o			r		
Lacistema aggregatum (Berg) Rusby							r																	
L. gardneri Kuntze																								
Laoensia pacari A. St.-Hil.								r	r	r	f		o	o	c	a		o		c	a	c		
Licania gardneri Kuntze																							f	r
L. humilis Cham. & Schltdl.					o		f																	
L. octandra (Hoffm. ex Roem & Schult.) Kuntze																								
L. sclerophylla Mart.ex Hook.f.								r					r											
*Licania*sp. (S1082)																								
Licania sp. (R7601)																								
Linociera hassleriana (Chodat) Hassler											c			r								o		
Lithraea molleoides (Vell.) Engl.																								
Ludwigia nenosa (Poir.) Ham.																								
Luehea candicans Mart.																								
L. grandiflora Mart.																								
L. paniculata Mart.								o		c	c			o	f			a				c	o	r
L. speciosa Willd.		o																						
Luetzelburgia auriculata (Allem.) Ducke																								
L. praecox Harms.																							r	
Mabea fistulifera Mart.						a							o					r			r			
Macairea radula DC.																								
Machaerium aculeatum Raddi																		o				r		
M. acutifolium Vogel							r		r			r	r		o	r		r			r	r		
M. angustifolium Mart. ex Benth.																								
M. hirtum (Vell.) Stellfeld																								
M. opacum Vogel													r		r	r		f					r	a
M. scleroxylon Tul.			r																					
Machaerium sp. (R8024Va)																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																								
	ROES*	ROQU*	ROPE*	ROPO*	ROPM*	ROCO*	ROVI*	TODA*	TOLJ*	TOPL*	TOTA*	TOPO*	TOPN*	TOMO*	TOMC*	TOCA*	TODI*	TOLA*	TOCR*	TOPA*	TOBA*	TOPU*	TONA*	TONT*
Maclura tinctoria (L.) Don ex Steud.																								
Magonia pubescens A. St.-Hil.		f						f		f	f			o	r			r		c	a	c	r	c
Maprounea guianensis Aubl.	r				c		c						o					r	r		r			
Martiodendron parviflorum Amshoff.																								
Matayba guianensis Aubl.	o	f		o		o	o			r	r			r	c						r	o	r	
M. illicifolius Mart. ex Reissek																								
Maytenus sp. (R7833)																								
Mezilaurus crassiramea (Meissn.) Taub.																								
M. itauba (Meissn.) Taubert																								
Miconia albicans (Sw.) Triana				f				r			o		o	o	o	c	o		f		f	o	o	r
M. burchellii Triana							f																	
M. fallax DC.					c	a	c																	
M. ferruginata DC.																								
*M. holosericea*Triana																								
M. macrothyrsa Benth.																								
M. pyrifolia Naud.																								
M. rubiginosa (Bonpl.) DC.					c		f																	
M. sellowiana Naud.																				c				
M. stenostachya DC.					c			r																
Miconia sp. (R7806)																								
Miconia sp. (Sueli 244)																								
Miconia sp. (R8199)																								
Miconia sp. (S2231)				o																				
Miconia sp. (S2232)				o																				
Miconia sp. (S2258)																								
Mimosa clausennii Benth.																								
M. exalbenses Barneby																								
M. hebecarpa Benth.																								
M. laticifera Rizzini & Mattos																								
M. pteridifolia Benth.																								
M. sericantha Benth.																								
Mimosa sp. (S552)																								
Mimosa sp. (R7635V)																								
Micropholis gardneriana (A . DC.) Pierre																								
*Mollia burchelli*Sprague	r												r											
Monnina martiana Klotzsch ex A. W. Benn.																								
Mouriri elliptica Mart,					r		r		c							o			o			r		
M. pusa Gardner									o							f			r	r			r	r
Myrcia albo-tomentosa Cambess.																								
M. canescens O. Berg																								
M. camapuanensis N. J. E. Silveira																								
M. decrescens O. Berg																								
M. gardneriana O. Berg																								
M. lanuginosa O. Berg																								
M. cf. lasiopus DC.																								
M. lingua (O. Berg) Mattos																								
M. mutabilis O. Berg																								
M. pallens DC.																								
M. cf. regneliana O . Berg																				r	r			
M. rorida Kiaersk.																								
M. rostrata DC.																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																									
	ROES*	ROQU*	ROPE*	ROPO*	ROPM*	ROCO*	ROVI*	TODA*	TOLJ*	TOPL*	TOTA*	TOPO*	TOPN*	TOMO*	TOMC*	TOCA*	TODI*	TOLA*	TOCR*	TOPA*	TOBA*	TOPU*	TONA*	TONT*
M. schottiana O. Berg																								
M. sellowiana O. Berg							r																	
M. splendens (Sw.) DC.														o	o			o	r	r	r	f		
M. cf. stictosepala Kiaersk.																								
M. tomentosa (Aubl.) DC.																								
M. uberavensis O. Berg																								
Myrcia sp. (R7695V)																								
Myrcia (R7516V)																								
*Myrcia*sp. (R8204)			o	o																				
Myrcia sp. (S2216)																								
Myrcia sp. (S2233)				o																				
Myrcia sp. (Sueli 241)																								
Myrcia sp. (Sueli 276)																								
Myrcia sp. (Sueli 275)																								
Myrcia sp. (R8239)					r																			
Myrcia sp. (R7874V)											r		r											
Myrcia sp. (R7890)												o	r											
Myrcia sp. (R7893)													a											
Myrcia sp. (R8239)							f																	
Myrcia sp. (R8262V)																								
Myrcia sp. (S2211)																								
Myrcia sp. (S2213)																								
Myrcia sp. (S2248)																								
Myrcia sp. (R7890)															f									
Myrcia sp. (R7944V)																							r	r
Myrcia sp. (R7927V)																								f
Myrcia sp. (R8159V)																								
Myrcia sp. (R8160)																								
Myrcia sp. (R8288)																								
Myrcia sp. (S2350)																								
Nectandra cf. cuspidata Nees & Mart.																								
Neea theifera Oerst.								o								r		r		o		r	o
Neea sp. (R7580)																								r
Norantea adamantina Cambess.																								
N. goyazensis Cambess.																								
Ocotea minarum Nees Mez.																								
O. suaveolens Hassl.																								
Ocotea sp. (R7775)																								
Ocotea sp. (R8283)																								
Ouratea castaneaefolia Engl.		r						r		r		o		r	r			r					r	
O. floribunda Engl.																								
O. hexasperma (A. St.-Hil.) Benth.									r			o		o	r	c	r	r	o	f	o	o	o	o
O. spectabilis (Mart.) Endl.	o				a	o	o																r	
Ouratea sp. (S2349)																								
Oxandra sessiliflora R.E. Fries									r															
Palicourea rigida Kunth					r		r			r		o	r	r									r	r
Parkia platycephala Benth.									r	r	r													
Peltogyne confertiflora (Hayne) Benth.																								
Pera glabrata (Schott.) Baill.																								
Peritassa campestris (Cambess.) A . C.																								
Persea pyrifolia Nees & Mart. ex Nees																								

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	ROES*	ROQU*	ROPE*	ROPO*	ROPM*	ROCO*	ROVI*	TODA*	TOLI*	TOPL*	TOTA*	TOPO*	TOPN*	TOMO*	TOMC*	TOCA*	TODI*	TOLA*	TOCR*	TOPA*	TOBA*	TOPU*	TONA*	TONT*
Physocallyma scaberrimum Pohl	f			c				o		c	a		r	r	o			c		r	a	o	o	o
Piper aduncum L.																								
Piptadenia gonoacantha (Mart.) Macbride																								
Pithecelobium moniliformis Benth.																								
Piptocarpha rotundifolia (Less.) Baker					r		f							o						r	o			
Pisonia graciliflora Mart.	f									o			r	o									r	
P. noxia Netto var. *noxia*																		f			r			
P. noxia var.*psammophila* Mart. ex J. A. Schmidt.							o								o			r						
Pisonia opposita (Vell.) Reitz.															o									
Pisonia sp. (R7842)																								
Pisonia sp. (R8293V)																								
Plathymenia reticulata Benth.	r		r	r		o	o	f	c			f	r	r	r	c	r		f	f	f	o	r	o
Platonia insignis Mart.																								
Platycyamus regnelli Benth.	r																							
Platypodium elegans Vogel	o	r		r																				
Playmiscium floribundum Vogel	r		r																					
Pouteria ramiflora (Mart.) Radlk.					c	o	o	r	c			r		o		r	r		a	o	o		a	o
P. torta (Mart.) Radlk.					r																			
Protium heptaphyllum (Aubl.) E. K. Marchal					r	r	r	r			r		o	o	o			r	r			r		r
P. ovatum Engl.					r																			
Pseudobombax longiflorum (Mart. & Zucc.) Robyns		o						r		f	o		f	f	o			o		r		o	r	o
P. marginatum (A. St.-Hil., A. Juss. & Cambess.) Robyns		a	a	f																				
P. tomentosum (Mart. & Zucc.) Robyns	c									c	r		f					f				r		
Psidium cinereum Mart. ex DC.																		o	r	r	o		o	
P. guianense Sw.										o	o			o	f							f	r	
P. myrsinoides O. Berg																								
P. pohliana O. Berg																								
P. warmingianum Kiaersk.																								
Psidium sp. (S1074)																								
Psidium sp. (R8096)																								
Pterodon polygalaeflora Benth.												r	r	r								r		o
P. pubenscens Benth.					o	o	c												r					
Qualea dichotoma (Mart.) Warm.																								
Q. grandiflora Mart.						r	r	o	r	f	f	c	o	f	f	c		o	a	c	c	a	f	a
Q. multiflora Mart.								r					r	r	r			o		r	r	o		
Q. parviflora Mart.		o			o	r	r	f		a	f	a	a	r	a	f	r	r	a	c	f	o	a	o
Rapanea ferruginea Spreng.																								
R. guianensis Kuntze																								
R. umbellata Mart.																								
Remijia amazonica K. Schum.					r																			
Rhamnidium elaeocarpum Reissek										o	f			r				c				f		
Richeria grandis Vahl										r														
Rollinia cf. *mucosa* (Jacq.) Baill.																								
R. silvatica A . St.-Hil.																								
Roupala montana Aubl.						f		r			r		r	o	r	r		o				r		

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																							
	ROES*	ROQU*	ROPE*	ROPO*	ROPM*	ROCO*	ROVI*	TODA*	TOLJ*	TOPL*	TOTA*	TOPO*	TOPN*	TOMO*	TOMC*	TOCA*	TODI*	TOLA*	TOCR*	TOPA*	TOBA*	TOPU*	TONA*	TONI*
Rourea induta Planch.						o	f		r			o				o		r		f	o		f	o
Rudgea burchelliana Mull. Arg.																								
R. viburnioides (Cham.) Benth.		r								r			r					r				r	r
Salacia crassifolia (Mart.) Peyr.								r	c	r	r	c	r	r	r	r			f	o	c	f	r	r
S. elliptica G.Don	r				r																	o		
Salacia sp. (R7633V)																								
Salacia sp. (S2246)							r																	
Salvertia convallariodora A. St.-Hil.							f	o				o	a	r	o	r		o	f	r	o	o		r
Sapium longifolium (Müll. Arg.) Huber																		r						
S. cf. obovatum Klotzsch ex Mull. Arg.																								
S. cf. petiolare (Mull. Arg.) Huber	r																							
Sapium sp. (S1090)																								
Schinopsis brasiliensis Engl.																								
Schinus longifolius (Lindl.) Speg. var. paraguariensis (Hassler) Barkl.																								
Sclerolobium aureum (Tul.) Benth.								f	a	o	r	f	o	f	o		r		o	f	f	o		r
S. paniculatum Vogel		f			a	a	a					r	o	o			r	r	f	f	o		o	o
Sebastiana brasiliensis Spreng.																								
Senna macranthera (DC. ex Coll.) Irwin & Barneby																								
S. silvestris (Vell.) Irwin & Barneby																								
S. spectabilis (DC.) Irwin & Barneby																								
S. velutina (Vogel) H.S. Irwin & R.C. Barneby																								
Simaba blanchetti Turcz.																								
Simarouba versicolor A. St.-Hil.	r						r	o	r	o	f	o	o	o	r	r		o		o	o	o		r
Simira rubescens (Bent.) Bremk. ex Steyemark		r		r																				
Siparuna guianensis Aubl.								o			r		o	o	o					r			o	r
Siphoneugena densiflora O. Berg																								
Solanum crinitum Lam.																								
S. lycocarpum St. Hil.							o																	
Solanum sp. (Rosanna 144)																								
Sorocea guilleminiana Gaudich.																								
Spiranthera odoratissima A . St-Hil.					o																			
Spondias mombin L.								r																
Sterculia striata A. St.-Hil. & Naud.																		r						
Strychnos pseudoquina A. St.-Hil.									f					r						r		r		r
Stryphnodendron adstringens (Mart.) Cov.																								
S. coriaceum Benth.							f																	
S. obovatum Benth.					r	c			o			f		f	o	a	o		f	f	f	f	o	
Styrax ambiguus Seubert					c		r																	
S. camporum Pohl																								
S. ferrugineus Nees & Mart.						r	r		o															
Swartzia sp.(S1032)																								
Syagrus comosa (Mart.) Mart.		r				o	f		f		r	o	f	f		c	o	r		o		o		
S. flexuosa (Mart.) Becc.	r						r	r					r	r			r	f		r		r		
S. oleracea (Mart.) Becc.																								
Symplocos nitens (Pohl.) Benth.																								
Tabebuia aurea (Manso) Bentham & Hook.f. ex S. Moore	o	a	f	r		r	r	o	f	f	o	o	r	r	c	r	o	o	r	o	r	r	o	

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																									
	ROES	ROQU	ROPE	ROPO	ROPM	ROCO	ROVI	TODA	TOLJ	TOPL	TOTA	TOPO	TOPN	TOMO	TOMC	TOCA	TODI	TOLA	TOCR	TOPA	TOBA	TOPU	TONA	TONI
T. impetiginosa (Mart.) Standl.								r										r				r		
T. ochracea (Cham.) Standl.							r		f		r	o	o	r	r	r	r	r	r	r	o	r		r
T. roseoalba (Ridley) Sandw.	r		o																			r		
T. serratifolia (Vahl.) Nich.	r		r	r			r	o		f		f		r		r			r		r			
Tapirira guianensis Aubl.		o						r							r								r	
Tapura amazonica Poepp. & Endl.	r									r			o		r							r		
Terminalia argentea Mart. & Zucc.		c									r			f	f	r		a		c	o	c	c	a
T. fagifolia Mart. & Zucc.																								
T. glabrescens Mart.	r																							
T. phaeocarpa Eichl.																								
Tetragastis balsamifera (Swartz) O. K.														o				r						
T. unifoliolata (Engl.) Cuatrec.																								
Tibouchina candolleana Cogn.																								
Tocoyena brasiliensis Mart.																								
T. formosa (Cham. & Schltdl.) Schum.							r	r	f	o	o	f	f	o	o	o	r	o	r		o		o	f
Tontelea brachypoda Miers																								
Toulicia crassifolia Radlk.																								
T. tomentosa Radlk.																								
Trattinickia rhoifolia Willd.																								
Trema micrantha Blume																		a						
Trichilia catigua C. DC.																								
T. elegans A. Juss.																								
T. pallida Sw.																								
Unonopsis sp. (S2250)						r																		
Vanillosmopsis. pohlii Baker																								
Vatairea macrocarpa (Benth.) Ducke		r						o	r	r	o	f	o		o	r		r	r		f	o	r	o
Vellozia squamata Pohl									r				o	r							r		r	
Vernonia ferruginea Less.	o	o								r								r		o	r	o		
Virola sebifera Aubl.															o			r				r		
V. subsessilis Warb.					r																			
Vismia glaziovii Rouhl.		c			r		f													r	f			
V. decipiens Cham. & Schltdl.																								
V. guianensis (Aubl.) Choisy																								
Vismia sp. (S1072)																								
Vismia sp. (R7843)																								
Vitex cymosa Bert.ex Spreng.															r							r		
V. panshiniana Moldencke																					r			
V. polygama Cham.																								
V. regnelliana Moldencke																								
Vitex sp. (S1032)																								
Vochysia cinnamomea Pohl																				o			r	r
V. elliptica (C. K. Spreng.) Mart.																								
V. gardneri Warm.																								
V. haenkeana Mart.							o				r					r		r						
V. rufa (C. K. Spreng.) Mart.					a		o		r	o	r	r	a	o	r	r	a				r	r	r	
V. thyrsoidea Pohl																								
V. tucanorum (C.K. Spreng.) Mart.																								
Ximenia americana L.																								
Xylopia aromatica Lam.		r			f	c	o	o	r		f		r		f	o	r	o	o	f	f	o	r	o

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																						
	ROES'	ROQU'	ROPE'	ROPO'	ROPM'	ROCO'	ROVI'	TODA'	TOLI'	TOPL'	TOTA'	TOPO'	TOPN'	TOMO'	TOMC'	TOCA'	TODI'	TOLA'	TOCR'	TOPA'	TOBA'	TOPU'	TONA'	TONT'
X. sericea A. St.-Hil.																							
Xylosma cf. *benthamii* Triana & Planch,																							
Zanthoxylum caribaeum Lam.																							
Z. cinereum Lam.																							
Z. gardneri Engler																							
*Z. rhoifolium*Lam.	c																						
Z. riedelianum Engl.														r								r	r
Zeyheria montana Mart.																							
Annonaceae sp. (R8202)																							
Annonaceae sp. (R8222)		r	r																				
Chrysobalanaceae (R8289V)																							
Euphorbiaceae R7777																							
Lauraceae sp. (R8072)																							
Lauraceae sp. (R8267)						o																	
Lauraceae sp. (R7677)																							
Lauraceae sp. (R8018)																							
Myrtaceae sp. (R7699)																							
Myrtaceae sp. (S2243)						f																	
Myrtaceae sp. (S2236)						a																	
Myurtaceae sp. (R8260)						a																	
Myrtaceae R7701																							
Myrtaceae S1127V																							
Myrtaceae S1126V																							
Myrtaceae S455																							
Myrtaceae Sueli 237																							
Myrtaceae Sueli 238																							
Myrtaceae Sueli 239																							
Myrtaceae sp. (R8226V)			r																				
Myrtaceae sp. (S2211)																							
Myrtaceae sp. (S2212)																							
Myrtaceae sp. (R8203)																							
Myrtaceae sp. (R8204)		f																					
Myrtaceae sp. (R8177V)																							
Myrtaceae sp. (R8178V)																							
Myrtaceae sp. (R8217)	o																						
Myrtaceae sp. (R8224)		o																					
Myrtaceae sp. (R8225)		f	o																				
Myrtaceae sp. (S2217)																							
Myrtaceae sp. (R8228)			r																				
Myrtaceae sp. (S2236)					r																		
Myrtaceae sp. (R8258V)																							
Myrtaceae sp. (R8276V)																							
Myrtaceae sp. (S2261)																							
Myrtaceae sp. (S2262)																							
Myrtaceae sp. (S2263)																							
Myrtaceae sp. (R7981A)																							
Myrtaceae sp. (R8017)																							
Myrtaceae sp. (R7847V)																							
Myrtaceae sp. (R7848V)																							

Continua ...

Tabela 2. Espécies encontradas nos 170 levantamentos rápidos realizados em Cerrado sentido amplo no Bioma Cerrado. Para ajustar a tabela, os levantamentos para as 576 espécies encontram-se agrupados em blocos de aproximadamente 25 localidades.(Continuação)

Espécies	Código das Localidades																											
	TONI	TOGU	TOGR	TOPE	TOGI	TOFG	TOGI	TORU	TOAL	TOPC	TOPI	TOAI	TOTE	TONE	TOLT	TOON	TOBO	TOBJ	TOBM	TORO	TOSO	TORI	TOAR	TORR	TOAI	TOSA
Abarema cochliacarpos (Gomes) R.C. Barneby & J.W. Grimes																												
Abuta grandifolia (Mart.) Sandw.																												
A. selloana Eichler																												
Acacia paniculata Willd.																												
A plumosa Lowe																												
A. aff. *polyphylla* DC.																												
Acosmium dasycarpum (Vog.) Yakovlev	r	o	o	o		o	r	p	r		o					o		r	r	r		r	r	o	r	r
A. nitens (Vog.) Yakovlev																												
A. subelegans (Mohl.) Yakovlev																												
Acrocomia aculeata (Jacq.) Lodd. ex Mart.		o																o		r				o		r	r
Aegiphila lhotskyana Cham.	r					r			r								r											
Agonandra brasiliensis Miers		r	r	r	r	r		p	r	r	o							r	r	o					r		r
Alouea trinervis Meissn.																												r
Albizzia niopoides (Spruce ex Benth.) Burk.																	r		o	r								
Alchornea schomburgkii Klotzsch																												
Alibertia concolor (Cham.) K. Schum.																												
A. edulis (L. Rich.) A. Rich.					r	r	r	p	r	r	o												r	o	o	r
A. elliptica (Cham.) K. Schum.														r		o	r				o						
A. obtusa Cham.		r		r		r			r		r		r			r			o		r	r		c	f	o
A. sessilis (Cham.) K. Schum.																												
A. verrucosa S. Moore	r																											
Alibertia sp. (R7844V)																												
Alibertia sp. (R7922)																												
Allophylus edulis Radlk. ex Warm.																												
Aloysia virgata Juss.																												
Amburana cearensis (Fr. Allem.) A.C.Sm.																												
Anacardium occidentale L.	r	r		o	o	o	r	p	r	r	o	r	o			o	o	o	f	r	r	o	o	r	f	f
Anadenanthera colubrina (Vell.) Brenan var. cebil (Griseb.) Altschul																		r								r
A. peregrina (Benth.) Speg.																				r							
Andira cordata Arroyo ex R.T. Pennington										o		o	f	o		r	o			r	r						
A. cuiabensis Benth.	r	r	r	o	r	c	r	p	o											r			r		f		
A. vermifuga (Mart.) Benth.	o	r	r	r	r	o	r		o	o			r			r	f	r	r	c	o	f	r		r	o	
Annona aurantiaca Barb. Rodr.																									a		
A. coriacea Mart.	r	o	r	o	f	f	o	p	f	r	o							f	o	r		r		r			r
A. crassiflora Mart.										r							c	o	r			r					
A. dioca A . St.-Hil.																												
A. tomentosa R.E. Fr.						r		p		o	o		r	r				r	r					o			
Annona sp. (R8012)																												
Antonia ovata Pohl		r	r									r										r	r	r			
Apeiba tibourbou Aubl.		r																	r	r							

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																												
	TONI*	TOGU*	TOGR*	TOPE*	TOGI*	TOFG*	TOGI*	TORU**	TOAL*	TOPC*	TOPT*	TOAI*	TOTE*	TONE*	TOLT*	TOON*	TOBO*	TOBJ*	TOBM*	TORO*	TOSO*	TORI*	TOAR*	TORR*	TOAI*	TOSA*
Apuleia leiocarpa J. Macbr.											r															
Aspidosperma cylindrocarpum Müll. Arg.																										
A. macrocarpon Mart.				r		r											r			r	r					r
A. multiflorum A. DC.																										
A. nobile Müll. Arg.	r	r	r	r	o	r	r	p	r														r			
A. parvifolium A. DC.																										
A. subincanum Mart.		f	o	r	r		r	p											f	r				o	o	o
A. tomentosum Mart.	r	f	c	r	f	c	c	p	f							f	r	r					r	r	r	o
Astrocaryum aculeatum G. Mey																										
A. vulgare Mart.																										
Astronium fraxinifolium Schott	f	c	f	f	o	f	f	p	c	o	f		r					o	f	o			c	a	f	f
A. urundeuva Fr. Allem.			r		r	r	r	p															r			
Attalea humilis Mart.											o															
A. phalerata Mart.																										
A. speciosa Mart. ex Spreng.																										
Austroplenckia populnea (Reissek) Lundell																										
Baccharis dracunculifolia DC.																										
Banisteriposis latifolia (A. Juss.) Cuatrec.																										
Banisteriopsis sp. (S755)																										
Bauhinia bongardii Steud.																										
B. cupulata Benth.																										
B. dubia G. Don.										r																
B. mollis Walp.						r																				
B. pulchella Benth.																									f	o
B. rufa (Bong.) Steud.							r																		f	o
B. ungulata L.																										
*Bauhinia*sp. (R7515V)																										
Bauhinia sp. (R7558)																										
Bauhinia sp. (R7559)																										
Bauhinia sp. (S759)																										
Blepharocalyx salicifolius (Kunth) O. Berg																										
Borojoa lanceolata (Cham.) Cuatrec.																										
Bowdichia virgilioides Kunth	o	o	f	o	o	f	o	p	o	r	r	r	r	r	r	o	o			r	o	r	o	o	o	o
Bredemeyera brevifolia Klotzsch ex A.W. Benn.																										
B. floribunda Willd.																							r			
Brosimum gaudichaudii Trécul	r	r	r	o	r	f	o		o								f	f			r	o	r	c		c
Buchenavia tetraphylla (Aubl.) R.A. Howard																										
B. tomentosa Eichler	r	r			o		o	p											r				o	r	f	o
Butia leiospatha (Mart.) Becc.																										
Byrsonima basiloba A. Juss.											o							r								
B. coccolobifolia Kunth	r	r		f	f	f	r	p	f	f	o					r					o	o	c			r
B. correaefolia A. Juss.																										
B. crassa Nied.	o	c	f	c	o	f	f	p	f	f	f	o	r			f	o	f	f	f	o	f	o	c	r	o
B. crassifolia (L.) Kunth																									f	
B. gardnerana A. Juss.																	r									

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																											
	TONI	TOGU	TOGR	TOPE	TOGI	TOFG	TOGI	TORU	TOAL	TOPC	TOPT	TOAP	TOTE	TONE	TOLT	TOON	TOBO	TORJ	TOBM	TORO	TOSO	TORI	TOAR	TORR	TOAI	TOSA
B. inodorum S. Moore										r																
B. intermedia A. Juss.																										
B. cf. oblongifolia A. Juss																										
B. sericea DC.																				f	f					
B. sessilifolia Benth.																										
B. stipulacea Adr. Juss.																										
B. vacciniaefolia A. Juss.																				o			r			
B. verbascifolia Rich. ex A. Juss.	r	o	o	f	o	o	f	p	o	r																
Byrsonima sp. (R7742V)																										
Byrsonima sp. (R7756V)																										
Cabralea canjerana (Vell.) Mart.																										
Caesalpinia bracteosa Tul.																								o	a	o
Callisthene fasciculata (Spreng.) Mart.				r				p			r								r							
C. cf. *hassleri* Briq.																									r	
C. major Mart.																										
C. minor(Mart)																							r	f	f	c
Callisthene cf. *mollissima* Warm.	a	a		a	f	r	o	p	a								r									
Calophyllum brasiliense Cambess.																								r		
Calotropis procera Dryend.																										
Calycophyllum multiflorum Griseb.																										
Campomanesia eugenioides Blume				o																						
C. cf. *xanthocarpa* O. Berg																										
*Caraipa densiflora*Mart.																										
Cardiopetalum calophyllum Schltdl.				r															c							
Cariniana domestica Miers																										
C. rubra Miers																								c	c	c
Caryocar brasiliense Cambess.						f	c	p																		
C. coriaceum Wittm.	f	o	o	c	c					r	o	o	f			c	a	a	o	c	a	a	o			
Casearia arborea Urb.																		r	r							o
C. grandiflora Cambess.											r															
C. javitensis Kunth																										
C. rupestris Eichler																										
C. sylvestris Sw.	o	o	o	f		r		p	o	f	c	r				o		r	a	f	r	r	o	a	o	
Cecropia cyrtostachya Miq.																										
C. pachystachya Trécul		o								r										r						r
Cedrella fissilis Vell.																										
Ceiba speciosa (A.St.-Hil.) Gibbs & Semir																										
Celtis pubescens (Kunth) Spreng.																										
Celtis sp. (R7548)																										
Cenostigma macrophyllum Tul.				f						a			f	a			r	r		o	o	o		o	o	
Cenostigma sp. (S552)																										
Cereus jamacaru DC.																										
Chaetocarpus echinocarpus (Baill.) Ducke																										
Chamaecrista orbiculata (Benth.) Irwin & Barneby																										
Cheiloclinium cognatum (Miers) A.C. Sm.																										

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																														
	TONI	TOGU	TOGR	TOPE	TOGP	TOFG	TOGI	TORU	TOAL	TOPC	TOPT	TOAP	TOTE	TONE	TOLT	TOON	TOBO	TORJ	TOBM	TORO	TOSO	TORI	TOAR	TORR	TOAI	TOSA
Chiococcoa alba Hitchc.																									r	o
Chomelia obtusa Cham. & Schltdl.																										
C. pohliana Müll. Arg.																										
C. ribesioides Benth.																										
Chrysophyllum arenarium Fr. Allem																										
C. marginatum Radlk.																										
C. rufum Mart.																										
Chrysophyllum sp. (S554)																										
*Chrysophylum*sp. (R7614)																										
Clusia sellowii Schltdl.																										
Coccoloba brasiliensis Nees & Mart.																										
C. mollis Casar.	r			r			r				o							r								
Cochlospermum orinocense Steud.																										
C. regium (Schrank) Pilg.																										
C. vitifolium (Willd.) Spreng.						r																				
Combretum duarteanum Cambess.																										
C. mellifluum Eich.																r					o	o				
Connarus suberosus Planch.	f		f	c	f	f	f	p	o	c	c	f	o	o		o	o	f	o	f	f	f	f	f		o
Copaifera langsdorfii Desf.	r	r						p	r		o				r	r		r	r							r
C. martii Hayne												o	r						r		r			r		
Cordia alliodora (Ruiz & Pav.) Oken	r																									
C. anabaptista Cham.											r		o									r				
C. glabrata (Mart.) A. DC.											r						c		f	r				r	a	r
C. insignis Cham.																										
C. sellowiana Cham.																										
C. trichotoma (Vell.) Arrab.																										
Cordia sp. (R7973V)							r																			
Couepia grandiflora (Mart. & Zucc.) Benth.	o	f	o	o	r	f		p	r							r				r	r		o			
Coussarea hydrangeaefolia Benth. & Hook.		r									o					o		f	f	r			r			
Croton urucurana Baill.																										
Croton sp. (R8122)													a													
Cupania rugosa Radlk.																										
C. vernalis Cambess.																										
Curatella americana L.	f	a	c	f	c	c	c	p	o	o						f		f	f	c		f	f	o	c	c
Cybianthus detergens Mart.																										
Cybistax antisyphilitica Mart.		f			r		r	p	r	r			o				o		r				o	o		
*Dalbergia cuiabensis*Benth.																										
D. glandulosa Benth.																										
D. miscolobium Benth.			o		r	o	r	p	f			o	o	o	r		r				r					
Davilla elliptica A. St.-Hil.	o	f	a	c	c	a	c	p	o	c	o	c	o	r	r	o		o	r	o	f	f		c		o
Desmoncus orthocanthos Mart.																										
Didymopanax distractiflorum Harms										o												r				
D. gardnerianum Tul.		f									o	r	o	o	o	o	o	f	f	o	f	f		o		
D. macrocarpum (Cham. & Schltdl.) Seem.																										
D. morototoni Decne. & Planch.																										
D. vinosum (Cham. & Schltdl.) March.																r										

Continua...

Tabela 2. Continuação.

Espécies	Código das Localidades																										
	TONI*	TOGU*	TOGR*	TOPE*	TOGI*	TOFG*	TOGI*	TORU**	TOAL*	TOPC*	TOPT*	TOAI*	TOTE*	TONE*	TOLT*	TOON*	TOBO*	TOBJ*	TOBM*	TORO*	TOSO*	TORI*	TOAR*	TORR*	TOAI*	TOSA*
Didymopanax sp. (S1092)																						r				
Didymopanax sp. (R8142V)																								r	r	
Didymopanax sp. (RS1004)																										f
Dilodendron bipinnatum Radlk.	o	r					r	p	r																	
Dimorphandra mollis Benth.	f		f	f	o	o	o	p	o	o						r	f		r	o		r	o			
Diospyros burchellii Hiern																										
D. hispida DC.	c	a	a	f	c	c	f	p	f	o	o			r		r	r	o	f	o	o	f	c	o	o	o
Diospyros sericea DC.	r			r		r			r														r	r		
Diospyros sp. (R7953V)																										
Dipteryx alata Vogel	r			r	r	r	r	p	r										r				o		c	o
Diptychandra aurantiaca (Mart.) Tul.																										
Dolíocarpus dentatus (Aubl.) Standl. Ssp. Dentatus																										
Duguetia furfuracea (A. St.-Hil.) Benth. & Hook.																										
D. glabriuscula R. E. Fries																										
D. lanceolata A. St.-Hil.																										
D. margraviana Mart.																										
Emmotum nitens (Benth.) Miers	r	r		r	r	r		p	r	r	r	r	r			o				o	o	o	r		r	r
Enterolobium contortisiliquum (Vell.) Morong																										
E. gummiferum (Mart.) J. Macbr.	r	r	r	r	r	r	r		o	o								r				r	r			
Ephederanthus parviflorus S.Moore																										
Eremanthus glomerulatus Less.																										
E. goyazensis Sch. Bip.																										
E. mattogrossensis Kuntze																										
E. rondoniensis MacLeish & Schumacher																										
Eriotheca gracilipes (Schum.) Robyns		r						p	r			o	o	f	f	r		r		r	f			r		r
E. parvifolia (Mart. & Zucc.) A. Robyns	r		r	r	r	o	r	p	r	f	f	o	r	o		f							r	o		
E. pubescens (Mart. & Zucc.) Schott. & Endl.					r		r	p	r																	
Eriotheca sp. (R7863V)																										
Erythroxylum cf. anguifugum Mart.																										
E. betulaceum Mart.																										
E. campestre A.St.-Hil.																										
E. cuneifolium Poepp. ex O.E. Schulz																										
E. daphnites Mart.											c														r	
E. deciduum A. St.-Hil.						o		p		c								o	f	o		o		c	r	o
E. engleri O . E. Schulz																										
E. pruinosum O. E. Schulz									f	f	o	o				o		r	r	o	r	r		r		r
E. suberosum A. St.-Hil.	c	f	c	c	c	c																r				
E. tortuosum Mart.	c	r	f		f	f		p		o														r		r
Erythroxylum sp. (S1006)																										
Erythroxylum sp. (R7600)																										
Erythroxylum sp. (R7870)																										
Erythroxylum sp. (R7870V)																										

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																												
	TONI*	TOGU*	TOGR*	TOPE*	TOGI*	TOFG*	TOGI*	TORU**	TOAL*	TOPC*	TOPI*	TOAI*	TOTE*	TONE*	TOLI*	TOON*	TOBO*	TORJ*	TOBM*	TORO*	TOSO*	TORI*	TOAR*	TORR*	TOAI*	TOSA*
Eschweilera nana (Berg) Miers											o	c	o	f	o	a					a					
E. aurata O. Berg	r								o																	
E. biflora DC.																										
E. chrysantha O. Berg																										
E. dysenterica DC.	f		f	f	r	r	r	p	r		r											r	c	a	a	f
E. florida DC.																										
E. cf. *gemmiflora* O. Berg																										
E. pumila Pohl																										
E. punicifolia (Kunth) DC.																										
Eugenia sp. (R7873)																										
Eugenia sp. (R7944)																										
Eugenia sp. (R7959)				o																						
Eupatorium squalidum DC.																										
Euplassa inaequalis (Pohl) Engl.																										
Ferdinandusa elliptica Pohl					r			p			r	o				o					r	r				r
Genipa americana L.																										
Guapira opposita (Vell.) Reitz.																										
Guazuma ulmifolia Lam.	o	o	r														f	r	o				r	o	r	o
Guettarda viburnioides Cham. & Schltdl.		f	o	f			o	p	f								o	r					o	c	o	o
Hancornia. speciosa Gomez	f	o	f	o	r	r	r	p	r	f	r		r		f	o	o				o	r	f	o		
Heisteria ovata Benth.													o						f							
Heisteria sp. (S553)																										
Helicteres lhoiskyana K. Schum.																										
Helicteres brevispira A. Juss.				r																						
H. macropelata A . Juss.																										
Heteropterys byrsonimifolia A. Juss.	r		r	r	r	r	r	p	o	f	c						o		r	r	a	r				
Himatanthus articulatus (Vahl) Woodson																	c	o	r							
H. obovatus (Müll. Arg.) Woodson	r	o	o	o	o	o	o	p	o	o	o	o	o	r	r	o				o	f	f	r	o	o	f
H. sucuuba (Spruce ex Mull. Arg.) R.E. Woodson																				o						
Hirtella ciliata Mart. ex Zucc.											r	a	a	a	a	a	a		f	a	a	o				
H. burchellii Britton																										
H. glandulosa Spreng.	r	r	r		r											r			r							
H. gracilipes (Hooker f.) Prance																										
Hymenaea courbaril L. var. *stilbocarpa* (Hayne) Lee & Lang.				r	r												r		r	r			r			
H. eriogyne Benth.														r	f		c								f	
H. stigonocarpa Mart. ex Hayne	r	r	o	o	r	r		p	r	f	f		c	r		o	o	o	o			o	r	o	f	o
Hyptidendron canum (Pohl ex Benth.) Harley																										
Inga cf. *affinis* DC.																										
I. alba Willd.																										
Inga sp. (R7550)																										
Jacaranda brasiliana Pers.		r		r			r		r		r							r		r			r		o	r
J. caroba (Vell.) DC.																										
J. cuspidifolia Mart.																										
J. macrantha Cham.																										

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																											
	TONI*	TOGU*	TOGR*	TOPE*	TOGI*	TOFG*	TOGI*	TORU**	TOAL*	TOPC*	TOPT*	TOAI*	TOTE*	TONE*	TOLT*	TOON*	TOBO*	TOBJ*	TOBM*	TORO*	TOSO*	TORI*	TOAR*	TORR*	TOAI*	TOSA*
J. rufa Silva Manso																												
Jatropha vitifolia Mill.		c	r	f	r		o		o																			
Kielmeyera coriacea (Spreng.) Mart.	f	o	f	o	o	o	o	p	o	o	o	o				r		r	r	o	o	o	o	o	r	o		
K. lathrophyton Saddi					r				r	c		c	a	r		f				o	c	f						
K. rubriflora A. St.-Hil.																												
K. speciosa A. St.-Hil.					c			p	r				f	r					r									
Kielmeyera sp. (R7954)	f	r	r	o						f			o		o	o								o		o		
Lacistema aggregatum (Berg) Rusby																												
L. gardneri Kuntze																												
Laoensia pacari A. St.-Hil.	a	a		f	a	r	f	p	o	f			c			f		f	o	f	o	o			f	o	o
Licania gardneri Kuntze	r																						r					
L. humilis Cham. & Schltdl.																												
L. octandra (Hoffm. ex Roem & Schult.) Kuntze																												
L. sclerophylla Mart.ex Hook.f.																												
*Licania*sp. (S1082)																												
Licania sp. (R7601)																												
Linociera	r						r		o																			
hassleriana (Chodat) Hassler																												
Lithraea molleoides (Vell.) Engl.																												
Ludwigia nenosa (Poir.) Ham.																												
Luehea candicans Mart.																												
L. grandiflora Mart.																												
L. paniculata Mart.	r	a	c	o	r	r	o	p	o		o							a	f	o			r	a	f	f		
L. speciosa Willd.																												
Luetzelburgia auriculata (Allem.) Ducke																												
L. praecox Harms.				r				p											r									
Mabea fistulifera Mart.																												
Macairea radula DC.																												
Machaerium aculeatum Raddi																												
M. acutifolium Vogel	r	f	f	o			r	p	o	f	f		o				f	c	r					o	o	c		
M. angustifolium Mart. ex Benth.																			r	o								
M. hirtum (Vell.) Stellfeld																							a	r	o	o		
M. opacum Vogel	o	o	o	o	r	r	r	p	r		o					r												
M. scleroxylon Tul.																												
Machaerium sp. (R8024Va)																												
Maclura tinctoria (L.) Don ex Steud.																							c	f	o	c		
Magonia pubescens A. St.-Hil.	f	c	c	o	o		f	p	f	o	o					r		a	c	c								
Maprounea guianensis Aubl.		r		r						a			f						a	o		r					
Martiodendron parviflorum Amshoff.																			r	r								
Matayba guianensis Aubl.																												
M. illicifolius Mart. ex Reissek																												
Maytenus sp. (R7833)																												
Mezilaurus crassiramea (Meissn.) Taub.			r																									
M. itauba (Meissn.) Taubert																												
Miconia albicans (Sw.) Triana		o	r		o						r					r	o	r	f	o		o	r					
M. burchellii Triana																												
M. fallax DC.											r																	

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																												
	TONI	TOGU	TOGR	TOPE	TOGF	TOFG	TOGI	TORU	TOAL	TOPC	TOPI	TOAI	TOTE	TONE	TOLT	TOON	TOBO	TOBJ	TOBM	TORO	TOSO	TORI	TOAR	TORR	TOAI	TOSA
M. ferruginata DC.												r				r		r	o	r							
*M. holosericea*Triana																											
M. macrothyrsa Benth.																											
M. pyrifolia Naud.																											
M. rubiginosa (Bonpl.) DC.																											
M. sellowiana Naud.																											
M. stenostachya DC.																											
Miconia sp. (R7806)																											
Miconia sp. (Sueli 244)																											
Miconia sp. (R8199)																											
Miconia sp. (S2231)																											
Miconia sp. (S2232)																											
Miconia sp. (S2258)																											
Mimosa clausennii Benth.																											
M. exalbenses Barneby																											
M. hebecarpa Benth.																											
M. laticifera Rizzini & Mattos				r											r												
M. pteridifolia Benth.																											
M. sericantha Benth.																											
Mimosa sp. (S552)																											
Mimosa sp. (R7635V)																											
Micropholis gardneriana (A. DC.) Pierre																											
Mollia burchelliiSprague																						r					
Monnina martiana Klotzsch ex A. W. Benn.							r																				
Mouriri elliptica Mart.	r	r	f	o	c	f	r	p				c	o		r	f	r			o	a			r			
M. pusa Gardner	r	r	r	o	r	r	r	p	r					r		f	r			r	r	r	r				
Myrcia albo-tomentosa Cambess.																								c			
M. canescens O. Berg																											
M. camapuanensis N. J. E. Silveira																											
M. decrescens O. Berg																											
M. gardneriana O. Berg																											
M. lanuginosa O. Berg																											
M. cf. lasiopus DC.																											
M. lingua (O. Berg) Mattos																											
M. mutabilis O. Berg																											
M. pallens DC.																											
M. cf. regneliana O . Berg																											
M. rorida Kiaersk.	r	r	o				o	p	c	f	f					f		r		r		o		o		o	
M. rostrata DC.																	c	f	f	o		o				o	
M. schottiana O. Berg																											
M. sellowiana O. Berg																		o	o	o	o	f			r		
M. splendens (Sw.) DC.		f		o	o		r		f	a	o	o	o	r		f											
M. cf. stictosepala Kiaersk.																											
M. tomentosa (Aubl.) DC.																											
M. uberavensis O. Berg																											
Myrcia sp. (R7695V)																											
Myrcia (R7516V)																											

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																													
	TONI	TOGU	TOGR	TOPE	TOGI	TOFG	TOGI	TORU	TOAL	TOPC	TOPI	TOAI	TOTE	TONE	TOLT	TOON	TOBO	TOBJ	TOBM	TORO	TOSO	TORI	TOAR	TORR	TOAI	TOSA
*Myrcia*sp. (R8204)																														
Myrcia sp. (S2216)																														
Myrcia sp. (S2233)																														
Myrcia sp. (Sueli 241)																														
Myrcia sp. (Sueli 276)																														
Myrcia sp. (Sueli 275)																														
Myrcia sp. (R8239)																														
Myrcia sp. (R7874V)																														
Myrcia sp. (R7890)																														
Myrcia sp. (R7893)																														
Myrcia sp. (R8239)																														
Myrcia sp. (R8262V)																														
Myrcia sp. (S2211)																														
Myrcia sp. (S2213)																														
Myrcia sp. (S2248)																														
Myrcia sp. (R7890)																														
Myrcia sp. (R7944V)																														
Myrcia sp. (R7927V)																														
Myrcia sp. (R8159V)																														
Myrcia sp. (R8160)																														
Myrcia sp. (R8288)																														
Myrcia sp. (S2350)																														
Nectandra cf. *cuspidata* Nees & Mart.																														
Neea theifera Oerst.	o		f	r	o			p	f			o				r		r	f	o	f		o						
Neea sp. (R7580)																							r							
Norantea adamantina Cambess.																														
N. goyazensis Cambess.																														
Ocotea minarum Nees Mez.																														
O. suaveolens Hassl.																														
Ocotea sp. (R7775)																														
Ocotea sp. (R8283)											r															r	r			
Ouratea castaneaefolia Engl.																														
O. floribunda Engl.																r	r	r	r	r	o	o	o	o			o			
O. hexasperma (A. St.-Hil.) Benth.	o	f	f	o	o	f	o	p	f	o	o	r								r	r						o			
O. spectabilis (Mart.) Endl.									r																					
Ouratea sp. (S2349)													r																	
Oxandra sessiliflora R.E. Fries																r				o	r		r							
Palicourea rigida Kunth		r			o	r		p			r	r					a	r	r	f		f								
Parkia platycephala Benth.										r			c																	
Peltogyne confertiflora (Hayne) Benth.				r			r																							
Pera glabrata (Schott.) Baill.																														
Peritassa campestris (Cambess.) A.C.																														
Persea pyrifolia Nees & Mart. ex Nees																														
Physocallyma scaberrimum Pohl				r							o							a	f	o		r	o							
Piper aduncum L.																														
Piptadenia gonoacantha (Mart.) Macbride		r																												
Pithecelobium moniliformis Benth.																														
Piptocarpha rotundifolia (Less.) Baker											r	o						r					r						

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																												
	TONI'	TOGU'	TOGR'	TOPE'	TOGI'	TOFG'	TOGI'	TORU''	TOAL'	TOPC'	TOPI'	TOAI'	TOTE'	TONE'	TOLT'	TOON'	TOBO'	TOBJ'	TOBM'	TORO'	TOSO'	TORI'	TOAR'	TORR'	TOAI'	TOSA'
Pisonia graciliflora Mart.				r							r	r				o		o	r					r		r
P. noxia Netto var. *noxia*					r																						
P. noxia var.*psammophila* Mart. ex J. A. Schmidt.									f		f					r			r								
Pisonia opposita (Vell.) Reitz.																											
Pisonia sp. (R7842)																											
Pisonia sp. (R8293V)																											
Plathymenia reticulata Benth.	f	o	o	r	r	r	r	p	r	r		r	r				f	r		f	r	o	o	r			
Platonia insignis Mart.																											
Platycyamus regnelli Benth.																											
Platypodium elegans Vogel																											
Playmiscium floribundum Vogel																											
Pouteria ramiflora (Mart.) Radlk.	f	r	f	o	f	a		p	r	o		f		o	r	r	f			f	c	c	o				
P. torta (Mart.) Radlk.																											
Protium heptaphyllum (Aubl.) E.K. Marchal	r			r	r		r	p	o		r		f			r		r	a	r			r	r	r	o
P. ovatum Engl.																											
Pseudobombax longiflorum (Mart. & Zucc.) Robyns	f	o	f	f	r	o	o	p	f	r	o					o		o	r				o	r	r	r
P. marginatum (A. St.-Hil., A. Juss. & Cambess.) Robyns																											
P. tomentosum (Mart. & Zucc.) Robyns	o	f					o	p			r					r		o	o	r			r	r	r	o
Psidium cinereum Mart. ex DC.																											
P. guianense Sw.	o	r	o	o																							
P. myrsinoides O. Berg	r	r	o	o	f	f			a	r	c					o	r	o	o	f	f	o		c	o	f
P. pohliana O. Berg																											
P. warmingianum Kiaersk.																											
Psidium sp. (S1074)										f																	
Psidium sp. (R8096)										r																	
Pterodon polygalaeflora Benth.	r	r	r	r						r	r					r	o	r				o	o		r	o
P. pubenscens Benth.					r		r		r												o						
Qualea dichotoma (Mart.) Warm.																			r								
Q. grandiflora Mart.	c	c	a	a	a	a	a	p	c	f	f		r			o	r	o	o	f	f	f	a	c	f	f
Q. multiflora Mart.		o					r	p			o		r			r		o	o	o				r	o	o
Q. parviflora Mart.	c	o	a	a	a	a	a	p	a	a	a	o	f		r	o	r	o	r	f	a	f	o	o	c	f
Rapanea ferruginea Spreng.																											
R. guianensis Kuntze																											
R. umbellata Mart.																											
Remijia amazonica K. Schum.																											
Rhamnidium elaeocarpum Reissek							r		r														c	r		
Richeria grandis Vahl																											
Rollinia cf. *mucosa* (Jacq.) Baill.																											
R. silvatica A . St.-Hil.																											
Roupala montana Aubl.		r			r	r	r		o	r						r		r	o	r		o		o	r	r
Rourea induta Planch.		o	c	o	o	r	o		r	r	r	o	o	o	f	o	r		r	r	f	o	o	r			
Rudgea burchelliana Mull. Arg.																			f								
R. viburnioides (Cham.) Benth.																		r	r				r			r	
Salacia crassifolia (Mart.) Peyr.	o	f	f	r	o	o	r	p	f	o	r						r			o	r		r			r	

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																												
	TONI	TOGU	TOGR	TOPE	TOGI	TOFG	TOGI	TORU	TOAL	TOPC	TOPI	TOAP	TOTE	TONE	TOLT	TOON	TOBO	TOBJ	TOBM	TORO	TOSO	TORI	TOAR	TORR	TOAI	TOSA
S. elliptica G.Don								p											r							r
Salacia sp. (R7633V)																											
Salacia sp. (S2246)																											
Salvertia convallariodora A. St.-Hil.	o	r		o	o	o	f	o		r	r	o	o	r			o		o	o	o	r	o	r	r		r
Sapium longifolium (Müll. Arg.) Huber																											
S. cf. *obovatum* Klotzsch ex Mull. Arg.											r																
S. cf. *petiolare* (Mull. Arg.) Huber																											
Sapium sp. (S1090)																	r		r								
Schinopsis brasiliensis Engl.																											
Schinus longifolius (Lindl.) Speg. var. paraguariensis (Hassler) Barkl.																											
Sclerolobium aureum (Tul.) Benth.	o	o	o	o	r	o		p	f	r	f					o		r	r	o	o	o	r	o	r		o
S. paniculatum Vogel	o	o	o		r	r	r	p	c	r	f	f	f	f	r	f	a		r	c	a	a	o	o			o
Sebastiana brasiliensis Spreng.																											
Senna macranthera (DC. ex Coll.) Irwin & Barneby																											
S. silvestris (Vell.) Irwin & Barneby																											
S. spectabilis (DC.) Irwin & Barneby																											
S. velutina (Vogel) H.S. Irwin & R.C. Barneby																											
Simaba blanchetti Turcz.																											
Simarouba versicolor A. St.-Hil.		r	o	o	o		r	p	r	r	r		r				o			r	r	r	r	o	r		o
Simira rubescens (Bent.) Bremk. ex Steyemark																											
Siparuna guianensis Aubl.	r								c			r				r		r	r			f	r		r		o
Siphoneugena densiflora O. Berg																											
Solanum crinitum Lam.																											
S. lycocarpum St. Hil.										o																	
Solanum sp. (Rosanna 144)																									r		
Sorocea guilleminiana Gaudich.																											
Spiranthera odoratissima A . St-Hil.																											
Spondias mombin L.																			r	r							
Sterculia striata A. St.-Hil. & Naud.	r															r		r		r		r	r	r			r
Strychnos pseudoquina A. St.-Hil.				r				p	r																		
Stryphnodendron adstringens (Mart.) Cov.														r				r			r						
S. coriaceum Benth.																											
S. obovatum Benth.	f	c	f	c	c	c	f		o	a	c	o	o	o	o	f	o	o	f	f	o	f		r			
Styrax ambiguus Seubert																											
S. camporum Pohl																											
S. ferrugineus Nees & Mart.	r																		r								
Swartzia sp.(S1032)																f		o	o	f		o					
Syagrus comosa (Mart.) Mart.		o	f	r	o	o	a	p	o	r	f	r						o	r								r
S. flexuosa (Mart.) Becc.		r	o	r	r		o		r		r							o									
S. oleracea (Mart.) Becc.																											
Symplocos nitens (Pohl.) Benth.																											
Tabebuia aurea (Manso) Bentham & Hook.f. ex S. Moore	r	r		o	r	o	r	p	o	o	o					r	o	a	o	o		f		r	o	o

Continua ...

Tabela 2. Continuação.

Espécies	Código das Localidades																												
	TONI*	TOGU*	TOGR*	TOPE*	TOGP*	TOFG*	TOGI*	TORU**	TOAL*	TOFC*	TOPI*	TOAP*	TOTE*	TONE*	TOLI*	TOON*	TOBO*	TORI*	TORM*	TORO*	TOSO*	TORI*	TOAR*	TORR*	TOAI*	TOSA*
T. impetiginosa (Mart.) Standl.																													r
T. ochracea (Cham.) Standl.	o			o	o	o	r			o	o		c			o		c		o	o	o	r	r				
T. roseoalba (Ridley) Sandw.							r		r									o	f										
T. serratifolia (Vahl.) Nich.					r					r	r					r		r	r	r						t	r		
Tapirira guianensis Aubl.	r							p	r							r								r	r	r			
Tapura amazonica Poepp. & Endl.											r									r									
Terminalia argentea Mart. & Zucc.	c	a	a	o			r	a	p	c						r							a	a	o	o			
T. fagifolia Mart. & Zucc.													r			r				r	o			r		r			
T. glabrescens Mart.																	r	o											
T. phaeocarpa Eichl.																													
Tetragastis balsamifera (Swartz) O.K.																													
T. unifoliolata (Engl.) Cuatrec.																													r
Tibouchina candolleana Cogn.																													
Tocoyena brasiliensis Mart.																													
T. formosa (Cham. & Schltdl.) Schum.	o	r	o	c	o	f	f	p	f	f	o	r	o		r	o	o	o	r	o	o	r	f	o	o	o			
Tontelea brachypoda Miers																													
Toulicia crassifolia Radlk.														r	f														
T. tamentosa Radlk.																													
Trattinickia rhoifolia Willd.																													
Trema micrantha Blume																													
Trichilia catigua C. DC.																													
T. elegans A. Juss.																													
T. pallida Sw.																													
Unonopsis sp. (S2250)																													
Vanillosmopsis pohlii Baker																													
Vatairea macrocarpa (Benth.) Ducke	r	f	f	o	r	r	r	p	r	f	o	r	r			o	f	r	r	o	c	f	o	o	r	r			
Vellozia squamata Pohl										o	f	c			f														
Vernonia ferruginea Less.										r								r				r		r					
Virola sebifera Aubl.												r			o				r	r									
V. subsessilis Warb.																													
Vismia glaziovii Rouhl.																													
V. decipiens Cham. & Schltdl.																													
V. guianensis (Aubl.) Choisy																													
Vismia sp. (S1072)										i								r	r			t							
Vismia sp. (R7843)																													
Vitex cymosa Bert.ex Spreng.			r								o																		
V. panshiniana Moldencke																													
V. polygama Cham.																													
V. regnelliana Moldencke												r		o					r										
Vitex sp. (S1032)																													
Vochysia cinnamomea Pohl		t						p		a						f	r	r	r	u	a		r						
V. elliptica (C. K. Spreng.) Mart.											r																		r
V. gardneri Warm.												a	a	o	o														
V. haenkeana Mart.																r			r										
V. rufa (C. K. Spreng.) Mart.					r			p												r									
V. thyrsoidea Pohl																													
V. tucanorum (C.K. Spreng.) Mart.																f				o									
Ximenia americana L.																													
Xylopia aromatica Lam.	f	o		o	c	o			r	r	r		r			r	r	r	r	o		r				r	r		
X. sericea A. St.-Hil.																													

Continua ...

Tabela 4. Exemplo dos dados de freqüência coletados para cada local nos levantamentos rápidos. Localização: 22 km a oeste de Lençóis. (12°26'S., 41°30'W). Mancha isolada de Cerrado; Número de espécies, 42; Data: 2 de agosto de 1998; Altitude: 780

ABUNDANTES

Annona coriacea Mart.
Dalbergia miscolobium Benth.
Emmotum nitens (Benth.) Miers
Abarema cochliacarpos Gomes, Barneby & Grim.
Simarouba versicolor A. St.- Hil.

COMUNS

Byrsonima sericea DC.
Miconia albicans (Sw.) Triana
Tapirira guianensis Aubl.

FREQÜENTES

Byrsonima correaefolia A. Juss.
Casearia grandiflora Cambess.
Chrysophyllum rufum Mart.
Duguetia furfuracea (A.St.-Hil.) Benth. & Hook. f.
Erythroxylum suberosum A. St.- Hil.
Sclerolobioum paniculatum Vogel
Vismia glaziovii Ruhl
Zanthoxylum rhoifolium Lam.

OCASIONAIS

Clusia sellowiana Schtdl.
Aegiphila lhotkyana Cham.
Bowdichia virgilioides Kunth
Cupania rugosa Radik.
Hymenaea stigonocarpa Mart. ex Hayne
Myrcia sp.
Rapanea guianensis Aubl.
Stryphnodendron obovatum Benth.
Vanillosmopsis pohlii Baker

RARAS

Bredemeyera brevifolia (Benth.) Kl. ex Benn.
Cochlospermum vitifolium (Willd.) Spreng.
Copaifera martii Hayne
Couepia sp. (S1082)
Hancornia speciosa Nees & Mart.
Himatanthus obovatus (Müll. Arg.) Woodson
Hirtella ciliata Mart. ex Zucc.
Jatropha vitifolia Mill.
Kielmeyera coriacea (Spreng.) Mart.
Maprounea guianensis Aubl.
Miconia cf. *pohliana* Cogn.
Ouratea spectabilis (Mart.) Endl.
Plathymenia reticulata Benth.
Protium heptaphyllum (Aubl.) E. K. Marchal
Salacia crassifolia (Mart.) Peyr.
Solanum lycocarpum A.St.-HII.
Vochysia thyrsoidea Pohl

DISCUSSÃO

A listagem da flora lenhosa aqui apresentada amplia bastante a informação sobre a distribuição geográfica dessas espécies na paisagem Cerrado sentido amplo, uma vez que os levantamentos aconteceram em locais pouco estudados, como Mato Grosso do Sul, Tocantins e Rondônia. Esses dados são extremamente importantes para generalizações sobre a presença de espécies de distribuição ampla ou restrita, já que agora estão disponíveis levantamentos para todo o bioma.

O método de levantamento florístico rápido mostrou que, com uma equipe experiente em reconhecimento de espécies lenhosas no campo, é possível estimar efetivamente, em cerca de 60 minutos, a presença da grande maioria das espécies lenhosas em locais inventariados no Cerrado sentido amplo.

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CARACTERÍSTICAS DA VEGETAÇÃO E DO SOLO EM DUAS COMUNIDADES VEGETAIS CONTÍGUAS NO TRIÂNGULO MINEIRO

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RESUMO – Estudaram-se variáveis de natureza pedológica e florística, objetivando explicar a seqüência floresta mesófila semidecídua – cerradão, numa vertente do Córrego Boa Vista, Bacia do Rio Araguari, Município de Uberlândia – MG. Na floresta mesófila, foram encontradas 83 espécies (CAP ≥ 10 cm) e 44 famílias, com índice de Shannon (H') para espécies de H'=3,7 nats/indivíduo e, no cerradão, amostraram-se 59 espécies de 35 famílias (H'= 3,4 nats/indivíduo). As três espécies com maior valor de importância (VI) na floresta foram: *Cheiloclinium cognatum, Tapirira peckoltiana* e *Copaifera langsdorffii*; no cerradão foram: *Siparuna guianensis, Qualea grandiflora* e *Caryocar brasiliense*. Lauraceae, Moraceae e Hipocrateacae, foram as famílias com maior VI na floresta e Vochysiaceae, Monimiaceae e Caesalpiniaceae, no cerradão. O solo sob a floresta apresentou maior teor de matéria orgânica e de Ca + Mg na camada superficial (0 a 1 cm), mas abaixo de 1 cm os valores caíram a níveis similares aos do cerradão. A água no solo, até 320 cm de profundidade, no mês de outubro, variou, vertente acima, de 42% a 15% na floresta, e, no cerradão, situou-se entre 16% e 13%, sugerindo ser esse um fator importante no estabelecimento da floresta na porção inferior da vertente.

Termos para indexação: fitossociologia, cerradão, floresta mesófila semidecídua, relações solo-vegetação.

ABSTRACT *– Pedological and floristic variables were studied aiming to explain the semideciduous mesophytic forest - savanna woodland boundaries, at the upper Boa Vista stream, a tributary of Araguari river, near Uberlândia, Minas Gerais, Brazil. In the semideciduous forest, 83 species (CAP ≥ 10 cm) and 44 families were observed, with Shannon's index of H'=3.7 nats/individual. In the savanna woodland, 59 species and 35 families were sampled, with Shannon's index of H'=3.4 nats/individual. The most important species of the forest were:*

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Cheiloclinium cognatum, Tapirira peckoltiana and Copaifera langsdorffii, and in the savanna woodland: Siparuna guianensis, Qualea grandiflora and Caryocar brasiliense. The most important families in the forest were: Lauraceae, Moraceae and Hippocrateaceae, and in the savanna woodland: Vochysiaceae, Monimiaceae and Caesalpiniaceae. In the superior stratum (0 – 1 cm), the soil of the forest presented greater content of organic matter, Ca+Mg but the values were similar of the savanna woodland values below 1 cm. The water content in the soil, at 320 cm depth, in October, varied from 42% to 15% beneath the forest, while it varied from 16% to 13% under the savanna woodland, suggesting that this is an important factor in the establishment of the forest down the slope from the watershed.

Index terms: Phytosociology, savanna woodland, semideciduous mesophytic forest, relationship soil-vegetation.

INTRODUÇÃO

Compreender as diferenças na fisionomia e na composição florística do bioma cerrado requer estudos mais detalhados das características edáficas e climáticas da região (Silva, 1993).

Observa-se, nesse bioma, a coexistência de comunidades vegetais de cerrado e florestas.

No gradiente cerrado-floresta, são observadas diferenças fisionômicas e florísticas em resposta a mudanças nas condições edáficas reinantes. Essas mudanças geralmente estão associadas às condições topográficas e litográficas, ou litológicas, que, por sua vez, são condicionadas por fatores de natureza geológica e geomorfológica (Cole, 1992). O gradiente cerrado-floresta é considerado, por diferentes autores, como resultante do regime de flutuação do lençol freático (Oliveira Filho et al., 1994), diferenças na profundidade (Haridasan, 1990), umidade (Askew et al., 1970; Furley, 1992) e fertilidade do solo (Ratter, 1992).

Estudos que envolvem relações cerrado-floresta e solo, na região do Triângulo Mineiro, têm-se tornado problemáticos devido à generalizada ação antrópica. O relevo pouco acentuado dessa região possibilitou a implantação de modelos agrícolas altamente devastadores. Para entender as interações entre diferentes comunidades vegetais remanescentes e as condições edáficas reinantes é imprescindível a manutenção dessas fitocenoses ou ampliação dos conhecimentos para a recuperação de áreas degradadas em ambientes similares.

Este estudo objetivou compilar algumas informações inerentes ao solo e à vegetação diferenciada que o recobre, buscando compreender a evolução do quadro fitogeográfico que denota o processo de avanço da vegetação florestal pela rede de drenagem que incide sobre o domínio do cerrado.

MATERIAL E MÉTODOS

O estudo foi realizado numa topossequência com 229 metros, estabelecida à margem direita da nascente de um tributário do Córrego Boa Vista, a 18°55' S e 48° 11' W, cobrindo área de aproximadamente 4 ha de floresta mesófila semidecídua e 3 ha de cerradão, situada no Município de Uberlândia, Minas Gerais. A drenagem local verte para a Bacia do Rio Araguari, estando o sítio estudado em posição elevada do interflúvio, em relevo suave-ondulado, a uma altitude de 780 metros. O entorno do sítio é ocupado por pastagem e agricultura.

Quanto aos aspectos edáficos, essa topossequência compreende três classes de solo de acordo com o Sistema Brasileiro de Classificação de Solos (Embrapa, 1999). Sob a floresta, ocorrem duas classes de solo: Gleissolo Háplico Tb Distrófico nos primeiros 22 metros; Latossolo Vermelho Distrófico até aproximadamente 120 metros, no limite com o cerradão, Latossolo Vermelho Distroférrico, que compreende o restante da topossequência (Tabela 1).

O clima, segundo a classificação de Köppen, é do tipo Cwa (mesotérmico), com duas estações bem definidas: uma seca, com período de estiagem que vai de maio a agosto e outra úmida que se estende de novembro a março (Embrapa, 1982).

O levantamento fitossociológico, nas duas comunidades vegetais, foi realizado utilizando-se o método de *point centred quarter method* (Cottam & Curtis, 1956). Em cada comunidade, os indivíduos lenhosos que apresentavam 10 cm ou mais de circunferência de tronco à altura do peito (CAP) e 2 metros ou mais de altura foram amostrados em 100 pontos. As espécies amostradas foram identificadas por especialistas ou por comparação com exsicatas existentes no *Herbarium Uberlandensis* (HUFU) da Universidade Federal de Uberlândia onde se encontra o material coletado.

Os dados fitossociológicos (densidade, freqüência, dominância, índice de valor de importância e de diversidade) foram obtidos pelo programa FITOPAC (Shepherd, 1994) e calculados de acordo com as fórmulas usuais (Mueller-Dombois & Ellenberg, 1974).

Tabela 1. Características químicas e teores de matéria orgânica (M.O.) nos solos sob floresta semidecídua (f) e no cerradão (c).

Prof. (cm)	pH (H_2O)		P mg.dm^{-3}		K		Ca + Mg cmol$_c$.dm^{-3}		Sb		V %		M. O. dag.kg^{-1}	
	f	c	f	c	f	c	f	c	f	c	f	c	f	c
0-1	4,5	4,7	2,1	2,3	0,18	0,13	3,2	1,5	3,3	1,6	27	19	8,5	5,3
1-3	4,5	4,5	1,9	1,3	0,12	0,11	1,1	0,8	1,2	0,5	15	06	4,6	4,7
3-6	4,6	4,6	1,5	0,4	0,11	0,08	0,5	0,1	0,5	0,3	08	05	3,8	3,6
6-10	4,7	4,8	1,1	0,5	0,07	0,07	0,3	0	0,3	0,3	07	04	3,9	3,3
10-20	4,7	4,8	0,3	0,4	0,04	0,04	0,2	0	0,2	0,1	05	03	2,5	2,9
20-40	4,8	4,9	0,2	0,3	0,02	0,02	0,1	0	0,2	0,1	05	03	1,9	2,2
100-120	5,2	5,4	0,5	0,5	0,01	0,01	0,1	0	0,1	0	09	04	0,9	1,8
200-220	5,6	5,6	1,1	0,4	0,01	0,00	0,1	0	0,1	0	06	04	0,6	0,9
300-320	5,7	5,8	2,2	0,3	0,01	0,01	0,2	0	0,2	0	10	03	0,5	1,0

Sb = soma de bases, V = saturação por bases. (floresta: n = 5, cerradão: n = 3). Prof: profundidade

Para o estudo do solo, estabeleceu-se um transecto de 229 metros, tomando-se por base a linha de drenagem (talvegue). Coletou-se o solo em sete pontos ao longo do transecto, sendo os cinco primeiros na floresta e os demais no cerradão. Na Tabela 2, encontram-se as distâncias entre os pontos de coleta e os respectivos desníveis em relação ao ponto mais baixo (ponto A). Para o posicionamento desses pontos, foram considerados aspectos referentes à vegetação e ao solo (microrrelevo, drenagem e cor).

As amostras de solo foram coletadas em camadas de 0 a 1 cm, de 1 a 3 cm, de 3 a 6 cm, de 6 a 10 cm, de 10 a 20 cm e de 20 a 40 cm, mediante a abertura de trincheiras até essas profundidades. A partir daí, utilizou-se um trado, tipo holandês, para coleta das demais amostras nas profundidades de 100 a 120 cm, de 200 a 220 cm e de 300 a 320 cm.

Tabela 2. Desnível e distância, a partir do talvegue (A) e os pontos de amostragem do solo sob as duas comunidades vegetais.

	Floresta						Cerradão	
	Pontos de amostragem							
	A	1	2	3	4	5	6	7
Distância (m)	0	16	22	38	72	119	182	229
Desnível (m)	0,0	4,7	6,8	9,2	11,9	15,3	18,7	20,1

Depois da obtenção da terra fina seca ao ar (TFSA), fração < 2 mm de diâmetro, foram feitas as análises químicas (pH, cátions trocáveis e matéria orgânica) e determinado o percentual de água no solo, conforme a metodologia preconizada pela Embrapa (1979). As determinações foram realizadas no laboratório de solos do Instituto de Ciências Agrárias da Universidade Federal de Uberlândia.

RESULTADOS E DISCUSSÃO

No levantamento fitossociológico, realizado nas duas comunidades vegetais, foram encontradas 125 espécies lenhosas. Na floresta semidecídua, amostraram-se 83 espécies distribuídas em 75 gêneros e 43 famílias (Tabela 3). As espécies *Apuleia molaris* (garapa), *Aspidosperma discolor* (peroba-branca), *Copaifera langsdorffii* (pau-d'óleo), *Hymenaea courbaril* (jatobá) e *Tapirira peckoltiana* (pau-pombo) compõem o dossel superior da floresta, com árvores emergentes de até 25 m de altura. Por sua vez, o cerradão apresentou 59 espécies distribuídas em 48 gêneros e 35 famílias (Tabela 3). As espécies *Caryocar brasiliense* (pequi), *Qualea grandiflora* (pau-terra-da-folha-larga), *Sclerolobium paniculatum* (carvoeiro), *Tapirira guianensis* (pau-pombo) e *Tapirira peckoltiana* (pau-pombo), com até 12 m de altura, foram as espécies que se destacaram no dossel superior.

Tabela 3. Espécies arbóreas amostradas na floresta semidecídua e no cerradão, ordenadas segundo o índice de valor de importância (IVI) da comunidade florestal.

Famílias	Espécie	IVI	
		Floresta	Cerradão
HIPPOCRATEACEAE	*Cheiloclinium cognatum* (Miers) A.C. Smith.	26,19	0
ANACARDIACEAE	*Tapirira peckoltiana* Engl.	24,38	10,44
CAESALPINIACEAE	*Copaifera langsdorffii* Desf.	19,68	0,58
MORACEAE	*Pseudolmedia laevigata* Trec.	18,59	0
MONIMIACEAE	*Siparuna guianensis* Aulb	16,79	31,04
LAURACEAE	*Nectandra membranacea* Ness Rohwer	13,76	0
CHRYSOBALANACEAE	*Hirtella racemosa* Lam	13,04	0
ANNONACEAE	*Unonopsis lindmanii* R. E. Fr	12,79	0
CHRYSOBALANACEAE	*Hirtella glandulosa* Spreng	10,17	0
BURSERACEAE	*Protium heptaphyllum* (Aulb.) March	9,37	0
MORACEAE	*Ficus enormis* (Mart. & Miq.) Miguel	9,12	0

Continua ...

Tabela 3. Continuação.

Famílias	Espécie	IVI	
		Floresta	Cerradão
COMBRETACEAE	*Terminalia brasiliensis* Eichl.	6,77	0
COMBRETACEAE	*Terminalia phaeocarpa* Eichl.	5,30	0
SAPOTACEAE	*Pouteria* sp.	5,18	0
RUBIACEAE	*Alibertia sessilis* (Vell.) K. Schum	5,03	0
LAURACEAE	*Nectandra cissiflora* Nees	4,82	0
OLACACEAE	*Heisteria ovata* Benth.	4,63	0
LAURACEAE	*Cryptocarya aschersoniana* Mez	4,35	0
LAURACEAE	*Ocotea corymbosa* (Meisen.) Mez	4,13	0
ANNONACEAE	*Duguetia lanceolata* St. Hil.	3,92	0
LECYTHIDACEAE	*Cariniana estrellensis* (Raddi) O. Kuntze	3,87	0
EUPHORBIACEAE	*Maprounea guianensis* Aulb.	3,55	5,58
FABACEAE	*Ormosia fastigiata* Tul.	3,15	0
ANNONACEAE	*Xylopia emarginata* Mart.	3,08	0
SAPOTACEAE	*Micropholis venulosa* (Mart. & Eichler) Pierre	3,03	0
MYRISTICACEAE	*Virola sebifera* Aulb.	2,91	0
LAURACEAE	*Ocotea* sp.	2,53	0
SAPINDACEAE	*Matayba guianensis* Aulb.	2,52	17,60
SYMPLOCACEAE	*Symplocus* sp.	2,51	0
CAESALPINIACEAE	*Apuleia molaris* Spruce ex Benth.	2,35	0
CUNONIACEAE	*Lamanonia ternata* Vell.	2,17	0
RUBIACEAE	*Ixora warmingii* Muell. Arg.	1,81	0
ELAEOCARPACEAE	*Sloanea monosperma* Vell.	1,75	0
TILIACEAE	*Luehea paniculata* Mart.	1,72	0
MELIACEAE	*Trichilia catigua* A. Juss.	1,66	0
PIPERACEAE	*Piper arboreum* Aubl.	1,65	0
OPILIACEAE	*Agonandra brasiliense* Miers	1,48	0
EUPHORBIACEAE	*Pera* sp.	1,32	0
ANACARDIACEAE	*Tapirira guianensis* Aulb.	1,27	10,49
CAESALPINIACEAE	*Sweetia fruticosa* Spreng.	1,24	0
OCHNACEAE	*Ouratea castaneaefolia* Engl.	1,23	0
STYRACACEAE	*Styrax camporum* (Pohl.)	1,17	0
MELIACEAE	*Guarea kunthiana* A. Juss.	1,16	0
CELASTRACEAE	*Maytenus* sp.	1,16	0
EBENACEAE	*Diospyros hispida* A. DC.	1,15	0
MELIACEAE	*Guarea guidonea* (L.) Sleumer	1,14	0
SAPINDACEAE	*Cupania vernallis* Camb.	1,14	0
FABACEAE	*Ormosia arborea* (Vell.) Harms.	1,14	0
MAGNOLIACEAE	*Talauma ovata* St. Hil.	1,13	0
PALMAE	*Euterpe edulis* Mart.	1,13	0
CAESALPINIACEAE	*Sclerolobium paniculatum* Vog.	1,12	14,75
FLACOURTEACEAE	*Casearia* sp.	1,11	0

Continua ...

Tabela 3. Continuação.

Famílias	Espécie	IVI	
		Floresta	Cerradão
APOCYNACEAE	*Aspidosperma cylindrocarpon* Muell. Arg.	1,10	0
LAURACEAE	*Ocotea spixiana* (Ness) Mez	1,10	0
ARALIACEAE	*Dendropanax cuneatum* Decne & Planch.	1,10	0
MYRTACEAE	*Siphoneugena densiflora* Berg	1,10	0
RUBIACEAE	*Amayoua intermedia* Steyerm.	1,10	0
RUBIACEAE	*Coutarea* sp.	1,10	0
CLUSIACEAE	*Calophyllum brasiliensis* Camb.	1,09	0
MYRTACEAE	*Myrcia rostrata* DC.	1,04	0
MIMOSACEAE	*Inga fagifolia* Willd.	0,87	0
MELASTOMATACEAE	*Miconia pseudo-nervosa* Cogr.	0,82	0
MYRTACEAE	*Eugenia florida* DC.	0,72	0
BORAGINACEAE	*Cordia sellowiana* Cham.	0,64	0
EUPHORBIACEAE	*Croton* sp.	0,64	0
RUBIACEAE	*Chomelia pohliana*	0,61	0
MONIMIACEAE	*Siparuna* sp.	0,61	0
APOCYNACEAE	*Aspidosperma discolor* A. DC.	0,60	0
MIMOSACEAE	*Inga* sp.2	0,58	0
BIGNONIACEAE	*Tabebuia serratifolia* (Vahl.) Nichols.	0,58	0
MELIACEAE	*Guarea* sp.	0,57	0
MYRTACEAE	*Psidium* sp. 2	0,57	0
ANNONACEAE	*Xylopia aromatica* Lam.	0,57	16,01
MIMOSACEAE	*Inga* sp.1	0,57	0
RHAMNACEAE	*Rhamnidium elaeocarpum* Reiss.	0,56	0
MORACEAE	*Ficus catappifolia* Kunth & Bouché ex Kunth	0,56	0
SYMPLOCACEAE	*Symplocos platyphylla* (Pohl.) Benth.	0,56	0
FLACOURTIACEAE	*Casearia gossypiosperma* Briquet	0,54	0
MYRSINACEAE	*Myrsine umbellata* (Mart.) Mez	0,54	0
MYRTACEAE	*Psidium* sp.1	0,54	0
RUBIACEAE	*Faramea cyanea* Mull. Arg.	0,54	0
LACISTEMATACEAE	*Lacistema aggregatum* (Berg.) Rusby	0,54	0
FLACOURTIACEAE	*Casearia sylvestris* Sw.	0,54	0
VOCHYSIACEAE	*Qualea grandiflora* Mart.	0	25,06
CARYOCARACEAE	*Caryocar brasiliense* Camb.	0	18,20
CLUSIACEAE	*Kielmeyera coriacea* (Spr.) Mart.	0	11,26
MELASTOMATACEAE	*Miconia albicans* (SW.) Triana	0	10,46
CAESALPINIACEAE	*Acosmium subelegans* (Mchlemb.) Yakov.	0	9,02
FABACEAE	*Bowdichia virgilioides* H. B. & K.	0	8,57
MIMOSACEAE	*Platymenia reticulata* Benth.	0	8,54
VOCHYSIACEAE	*Qualea multiflora* Mart.	0	8,10
MALPIGHIACEAE	*Byrsonima crassa* Nied.	0	7,89
VOCHYSIACEAE	*Qualea parviflora* Mart.	0	6,16

Continua ...

Tabela 3. Continuação.

Famílias	Espécie	IVI	
		Floresta	Cerradão
MYRTACEAE	*Blepharocalix acuminatus* H. B. & K.	0	5,88
EUPHORBIACEAE	*Maprounea guianensis* Aubl.	0	5,58
LYTHRACEAE	*Lafoensia pacari* St. Hil.	0	5,14
MALPIGHIACEAE	*Byrsonima intermedia* Juss.	0	4,92
COMBRETACEAE	*Terminalia argentea* Mart. & Zucc.	0	4,55
VOCHYSIACEAE	*Vochysia cinnamomea* Pohl.	0	4,43
CHRYSOBALANACEAE	*Couepia grandiflora* Benth.	0	4,27
FABACEAE	*Machaerium opacum* Vog.	0	4,08
ERYTHROXYLACEAE	*Erythroxylum deciduum* St. Hill.	0	3,54
PROTEACEAE	*Roupala montana* Aulb.	0	3,34
CONNARACEAE	*Connarus suberosus* Planch.	0	3,03
CAESLPINIACEAE	*Dimorphandra mollis* Benth.	0	2,98
ANNONACEAE	*Annona crassiflora* Mart.	0	2,65
FABACEAE	*Dalbergia violacea* (Vog.) Malme	0	2,52
MYRISTICACEAE	*Virola sebifera* Aulb.	0	2,44
MALPIGHIACEAE	*Byrsonima coccolobifolia* Kth.	0	2,23
VOCHYSIACEAE	*Vochysia rufa* Mart.	0	1,80
EBENACEAE	*Diospyros burchellii* Hiern	0	1,75
EUPHORBIACEAE	*Pera glabrata* (Schott.) Baill.	0	1,40
ANACARDIACEAE	*Lithraea molleoides* (Vell.) Engl.	0	1,35
SOLANACEAE	*Solanum lycocarpum* St. Hil.	0	1,32
CAESALPINIACEAE	*Acosmium dasycarpum* (Vog.) Yakov.	0	1,29
VERBENACEAE	*Aegiphila sellowiana* Cham.	0	1,22
MYRSINACEAE	*Myrcine guianensis* Aulb.	0	1,19
MYRTACEAE	*Myrcia variabilis* Mart. ex DC.	0	1,19
APOCYNACEAE	*Hancornia pubescens* Nees & Mart.	0	1,13
CAESALPINIACEAE	*Hymenaea stigonocarpa* Mart. Ex Hayne	0	0,99
CAESALPINIACEAE	*Hymenaea courbaril* L.	0	0,94
NYCTAGINACEAE	*Neea theifera* Oerst.	0	0,92
ERYTHROXYLACEAE	*Erythroxylum suberosum* St. Hill.	0	0,65
ANNONACEAE	*Xylopia sericea* St. Hill.	0	0,63
STYRACACEAE	*Styrax ferrugineus* Nees et Mart.	0	0,62
RUBIACEAE	*Rudgea viburnioides* (Cham.) Benth.	0	0,61
NYCTAGINACEAE	*Guapira noxia* (Netto) Lund	0	0,60
SAPOTACEAE	*Chrysophyllum marginatum* (Hook. & Arn.) Radlk	0	0,60
TILIACEAE	*Luehea grandiflora* Mart. & Zucc.	0	0,59
ARALIACEAE	*Didymopanax macrocarpum* (C. & S.) Seem.	0	0,58
MORACEAE	*Brosimum gaudichaudii* Trec.	0	0,58
RUBIACEAE	*Guettarda viburnioides* Cham. Et Schl	0	0,58
FABACEAE	*Andiara paniculata* Benth.	0	0,57
OCHNACEAE	*Ouratea hexasperma* (St. Hil.) Baill.	0	0,57
BOMBACACEAE	*Pseudobombax tomentosum* (Mart.&Zucc.) A.Robyns	0	0,57

Lauraceae (6), Rubiaceae (6) e Myrtaceae (5) foram as famílias com maior número de espécies na floresta semidecídua. A família Lauraceae foi amostrada exclusivamente na floresta semidecídua, sendo *Nectandra membranacea, N. cissiflora* e *Cryptocarya archersoniana* as espécies mais importantes. Espécies da família Lauraceae, com altos valores de dominância, foram encontradas em matas no Triângulo Mineiro (Araújo et al., 1997a; Araújo & Haridasan, 1977) e no sul de Minas (Oliveira Filho et al., 1994b). Essas espécies, com grande biomassa arbórea, parecem ter preferência por comunidades vegetais de florestas semidecíduas que ocorrem em solos com características semelhantes às encontradas neste estudo.

No cerradão, as três famílias com maior número de espécies foram Caesalpiniaceae (6), Vochysiaceae (5) e Fabaceae (4). Vochysiaceae e Malpiguiaceae ocorreram exclusivamente nessa fisionomia vegetal. As três espécies do gênero *Qualea,* (família Vochysiaceae) tiveram IVIs acima de seis (Tabela 3) e compõem o estrato arbóreo de maior porte. Características fitossociológicas do gênero *Qualea,* que ocorrem no cerrado brasileiro, foram amplamente discutidas por Ribeiro et al. (1985) e Ratter et al. (1996), mostrando que *Qualea grandiflora, Q. parviflora e Q. multiflora* são espécies que se destacam na fisionomia dessas comunidades vegetais. Na família Malpighiaceae, as três espécies do gênero *Byrsonima* tiveram IVIs de 2,2 a 7,9 (Tabela 3), sendo a mais importante *Byrsonima crassa.*

As dez espécies com maior valor de importância na floresta (Figura 1) corresponderam 55% do IVI total. Dessas espécies, *Cheiloclinium cognatum* e *Siparuna guianensis* ocorreram com maior densidade (Figura 1) no sub-bosque e apresentaram essa mesma característica em outras florestas semidecíduas estudadas no Triângulo Mineiro (Araújo *et al.*, 1997; Araújo & Haridasan, 1997). *Pseudolmedia laevigata* e *Protium heptaphyllum* foram encontradas em Matas de Galeria (Schiavini, 1992; Oliveira Filho et al., 1994a; Pinto & Oliveira Filho, 1999) e na presente amostragem, ocorreu com maior densidade na área mais úmida da floresta, demonstrando sua aptidão para ocupar esses ambientes. *Copaifera langsdorffii*, espécie com alta dominância (Figura 1), também ocorreu entre as de maior IVI em comunidades semelhantes à deste estudo no Triângulo Mineiro (Araújo et al., 1997a; Araújo & Haridasan, 1997) e no sul de Minas (Oliveira Filho et al. 1994b), confirmando sua ampla ocorrência em fisionomias florestais. *Hirtella glandulosa,* espécie encontrada no cerradão em solos distróficos, também denominados de "Cerradão de *Hirtella glandulosa*" por Ratter et al. (1977) foi amostrada, neste estudo, principalmente na borda da floresta.

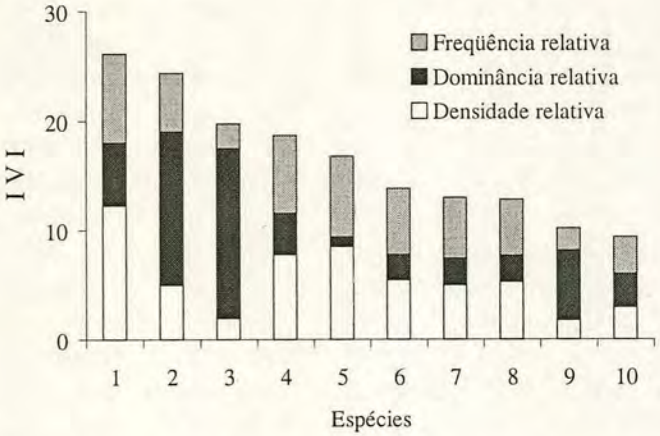

Figura 1. Parâmetros fitossociológicos das espécies com maior IVI amostradas na floresta semidecídua.
1 = *Cheiloclinium cognatum*, 2 = *Tapirira peckoltiana*, 3 = *Copaifera langsdorffii*, 4 = *Pseudolmedia laevigata*, 5 = *Siparuna guianensis*, 6 = *Nectandra membranacea*, 7 = *Hirtella glandulosa*, 8 = *Unonopsis lindmanii*, 9 = *Hirtella glandulosa* e 10 = *Protium heptaphyllum*.

Na Figura 2, observa-se que as dez espécies mais importantes no cerradão alcançaram 55,1% do IVI total. Entre essas, *Siparuna guianensis* foi a de maior valor de importância no cerradão, mas também ocorreu com alta densidade na floresta, demonstrando considerável capacidade de adaptação no sub-bosque dessas duas comunidades vegetais. *Qualea grandiflora* e *Caryocar brasiliense* tiveram alta dominância no cerradão (Figura 2), sendo encontradas com essa mesma característica no cerrado do Triângulo Mineiro (Goodland, 1979; Araújo et al., 1977b) e em outras regiões brasileiras (Ribeiro et al., 1985; Ratter et al., 1996). *Sclerolobium paniculatum*, espécie que ocorreu entre as de maior IVI (Figura 2), devido principalmente a sua dominância relativa, é também mencionada no trabalho de Oliveira Filho & Martins (1986) como de ocorrência no cerradão e transições para floresta em Mato Grosso. *Matayba guianensis* e *Xilopia aromatica* que apresentaram maior densidade em áreas degradadas do cerrado do Triângulo Mineiro (Araújo et al., 1997b) foram encontradas com altos valores de IVI no cerradão (Figura 2), indicando possíveis perturbações nessa fisionomia vegetal.

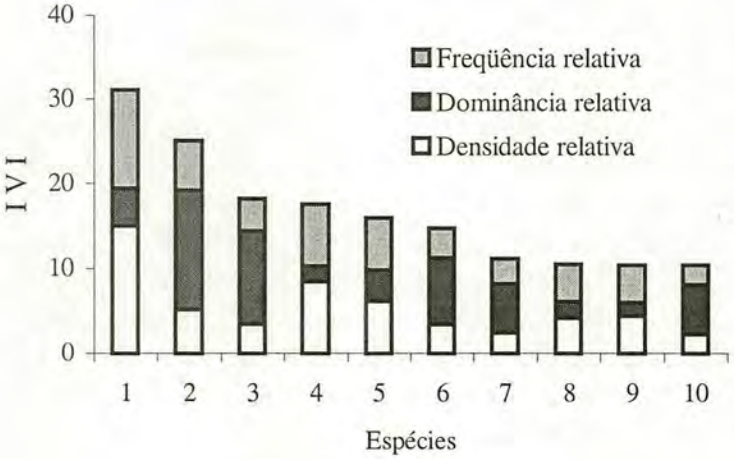

Figura 2. Parâmetros fitossociológicos das espécies com maior IVI amostradas no cerradão. 1 = *Siparuna guianensis*, 2 = *Qualea grandiflora*, 3 = *Caryocar brasiliense*, 4 = *Matayba guianensis*, 5 = *Xylopia aromatica*, 6 = *Sclerolobium paniculatum*, 7 = *Kielmeyera coriacea*, 8 = *Tapirira guianensis*, 9 = *Miconia albicans* e 10 = *Tapirira peckoltiana*.

O índice de diversidade de Shannon, para espécies da Floresta, foi de H'=3,7 nats/indivíduo, mostrando diversidade florística próxima aos valores obtidos (3,7 e 4,1) em outros estudos em florestas, na mesma região (Araújo et al., 1997a; Araújo & Haridasan, 1997). O índice de Shannon, na comunidade vegetal de cerradão, foi de 3,4 nats/indivíduo.

Oito espécies foram comuns aos dois ambientes estudados, apresentando 11,3 % de similaridade. O baixo valor obtido com esse índice corrobora a distinção florística dessas duas comunidades. Entre as espécies comuns encontram-se *Copaifera langsdorffii*, *Siparuna guianensis* e *Tapirira guianensis*, conhecidas como de ampla plasticidade em comunidades vegetais no Município de Uberlândia (Araújo & Haridasan, 1997; Araújo et al., 1997b).

Considerando os níveis de acidez ativa, apresentados pela CFSEMG (1999), verifica-se que os valores de pH em H_2O (Tabela 1) enquadram os solos das duas comunidades vegetais,

na classe acidez elevada (pH 4,5 a 4,9), nos horizontes mais superficiais, por causa da matéria orgânica. A acidez em profundidades maiores que 100 cm, independentemente do tipo de cobertura vegetal original, foi média, com valores de pH, variando de 5,2 a 5,8.

Os resultados analíticos de caracterização do solo (Tabela 1) mostram maior disponibilidade de nutrientes, essencialmente Ca + Mg e maior teor de matéria orgânica (cerca de 38% a mais), apenas na camada de 0 a 1 cm no ecossistema Floresta.

De acordo com Resende et al. (1999), essa diferença, restrita à interface com a liteira, deve-se à maior dinâmica da matéria orgânica no solo sob floresta (maior produção e maior decomposição por unidade de tempo), em relação ao que ocorre nos solos sob cerrado. Diferenças no estoque de matéria orgânica no solo, maiores sob floresta semidecídua do que sob cerradão, são também apresentadas por Lepsch et al. (1994). Silva & Leitão Filho (1982) e Rodrigues et al. (1989) comentam que os maiores teores de nutrientes na camada superficial, em florestas situadas em solos distróficos, no Estado de São Paulo, são uma evidência da contribuição da ciclagem de nutrientes para a maior fertilidade dessa camada. Esse incremento decorre da própria vegetação, mas pode constituir fator sinergético no processo de expansão da floresta em áreas de domínio do cerrado.

Em relação aos percentuais de água no solo (Figura 3), observou-se decréscimo da floresta para o cerradão. A água no solo, no mês de outubro, variou de 42% a 15% na floresta (pontos 1 a 5), enquanto, no cerradão (pontos 6 e 7), esta situou-se entre 16% a 13%, sugerindo ser esse fator importante no estabelecimento da floresta na porção inferior da vertente. O maior teor de água no solo sob a vegetação florestal, até aproximadamente 9,2 m de desnível em relação ao talveque, conforme mostram os dados da Tabela 2 e Figura 3, constitui uma informação que corrobora a hipótese de que a diferença no teor de água no solo é um dos fatores que determinam a ocorrência de floresta e cerrado lado a lado, conforme afirmam Cole (1992) e Furley (1992). Características inerentes à litologia e à geomorfologia, que se expressam no solo, podem, de acordo com Cole (1992) e Askew et al. (1970), interferir no teor de água disponível às plantas.

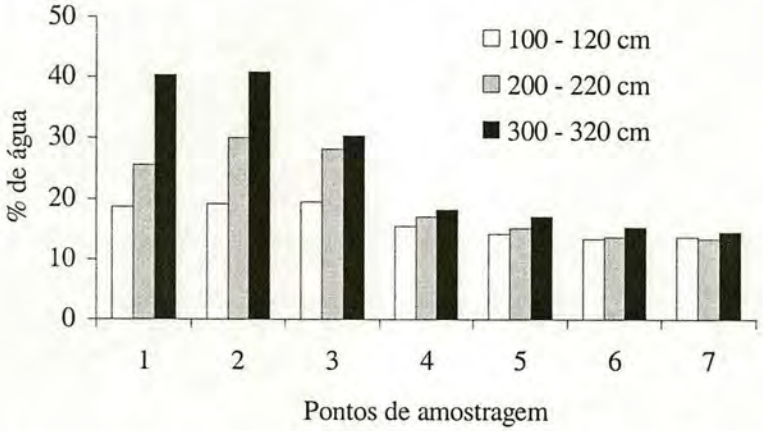

Figura 3. Percentuais de água no solo, em três profundidades, obtidos no final da estação relativamente seca (outubro), nas comunidades vegetais de floresta semidecídua (pontos 1, 2, 3, 4 e 5) e cerradão (pontos 6 e 7).

CONCLUSÃO

A presença de vegetação florestal em áreas contíguas à drenagem, limitando-se com o cerradão em posição mais elevada na vertente, recobrindo solos distróficos ou álicos, indicam que essa seqüência florística não decorre em razão de variações na fertilidade do solo. Com base neste estudo, o teor de água no solo é a variável com a qual melhor se ajusta o quadro florístico apresentado, ou seja, a presença da floresta em áreas mais úmidas do que aquelas ainda ocupadas por cerradão.

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NOVOS SINÔNIMOS DE *ERYTHROXYLUM* P. BROWNE (ERYTHROXYLACEAE)

Joalice de Oliveira Mendonça[1]; Ayrton Amaral Jr.[1]

RESUMO – São propostos sete novos sinônimos de espécies de *Erythroxylum* P. Browne: *E. cyclophyllum* O. E. Schulz como sinônimo de *E. cuneifolium* (Mart.) O. E. Schulz; *E. hasslerianum* Chodat, *E. hasslerianum* Chodat f. *angustifolia* Chodat & Hassler, *E. hasslerianum* Chodat f. *elliptica* Chodat & Hassler, *E. deciduum* A. St.-Hil. var. *angustifolium* (Mart.) O. E. Schulz e *E. deciduum* A. St.-Hil. var. *glaucum* (Mart.) O. E. Schulz como sinônimos de *E. nanum* A. St.-Hil. e *E. flexuosum* O. E. Schulz como sinônimo de *E. pelleterianum* A. St.-Hil.; os respectivos tipos nomenclaturais são também indicados.

Termos para indexação: Erythroxylaceae, *Erythroxylum*, Taxonomia Vegetal.

ABSTRACT *– Seven new synonyms of Erythroxylum P. Browne species were proposed: E. cyclophyllum O. E. Schulz as synonymous with E. cuneifolium (Mart.) O. E. Schulz; E. hasslerianum Chodat, E. hasslerianum Chodat f. angustifolia Chodat & Hassler, E. hasslerianum Chodat f. elliptica Chodat & Hassler, E. deciduum A. St.-Hil. var. angustifolium (Mart.) O. E. Schulz and E. deciduum A. St.-Hil. var. glaucum (Mart.) O. E. Schulz as synonymous with E. nanum A. St.-Hil. and E. flexuosum O. E. Schulz as synonymous with E. pelleterianum A. St.-Hil.; the typus are also indicated.*

Index terms: Erythroxylaceae, Erythroxylum, Plant Taxonomy.

INTRODUÇÃO

Durante a execução de alguns trabalhos taxonômicos sobre o gênero *Erythroxylum* P. Browne (Amaral Jr., 1974, 1980, 1996; Amaral Jr. & Leoni, 1992; Mendonça & Amaral Jr., 1998; Mendonça et al. 1998; Barbosa & Amaral Jr., 2001), tivemos a oportunidade de examinar grande número de exsicatas, bem como o comportamento de muitas de suas espécies no ambiente natural.

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Como parte do resultado desses estudos e observações apresentamos alguns novos sinônimos e lectotipificações.

MATERIAL E MÉTODOS

Foram estudadas exsicatas dos seguintes herbários: A, B, BOTU, BR, F, G, K, NY, P, S, W (as siglas estão de acordo com Holmgren et al., 1990). As fotografias dos tipos nomenclaturais da coleção do Field Museum of Natural History de Chicago examinados estão indicadas no texto como F neg. nº.

As indicações de lectótipos nas etiquetas de herbários, feitas pelo Dr. Timothy Plowman (Field Museum of Natural History de Chicago), foram revisadas e quando aceitas, citadas no texto como *in sched.*

RESULTADOS E DISCUSSÃO

1. *Erythroxylum cuneifolium* (Mart.) O. E. Schulz, in A. Engl. Pflanzenr. IV.134(29):121, fig. 21.1907.

= *Erythroxylum cyclophyllum* O. E. Schulz syn. nov.

Erythroxylum cyclophyllum O. E. Schulz, in A. Engl. Pflanzenr. IV.134 (29) 93.1907.

Holótipo: Burchell nº 4117, Brasil, São Paulo, Tanque de Zunica, Caveira Santa, 3 de fevereiro de 1827, K! e F neg. nº 55587!

Schulz (1907) descreveu *E. cyclophyllum* para o Estado de São Paulo. Com base no material estéril de uma única coleta feita por Burchell (nº 4117). Como o autor não indicou o local de coleta, somente foi possível recuperar essa informação por meio do trabalho de Smith & Smith (1967) que trata do itinerário de Burchell no Brasil. Foi examinado o holótipo depositado em K e constatou-se tratar de uma das inúmeras variações que *E. cuneifolium* apresenta em função do ambiente. O local onde foi coletado o holótipo faz parte da área de ocorrência de *E. cuneifolium*, espécie com ampla distribuição geográfica. Amaral Jr. (1974) comentou e ilustrou a grande variação tanto no tamanho quanto na forma apresentada pelas folhas dessa espécie.

2. *Erythroxylum nanum* A. St.-Hil., in Fl. Bras. merid. 2:97.1829.

Tratado por Schulz (1907) como sinônimo de *E. deciduum* A. St.-Hil., esse nome foi restabelecido por Amaral Jr. (1974). Posteriormente Amaral Jr. (1976), ao indicar novas localidades de ocorrência do gênero *Erythroxylum*, passou a utilizar definitivamente esse nome, o que também foi corroborado por Mendonça et al. (1998). Realmente se for comparado um pequeno ramo de *E. deciduum* com outro de *E. nanum* nas mesmas condições, provavelmente, numa primeira análise, ambas poderiam ser

interpretadas como sendo da mesma espécie, entretanto, no campo, esse engano torna-se impossível devido às grandes diferenças de hábito entre elas. As principais diferenças são: *E. deciduum* ocorre em Cerrado fechado, Cerrado e bordas de Matas Ciliares como arbusto, arvoreta ou árvore isolada, de 2 a 10 m de altura; ramos retos, bastante ramificados; pecíolo de 2 a 5 mm de comprimento de 0,8 a 1,2 mm de espessura; folha 37 a 97 mm x 12 a 42 mm, elíptica, oblonga ou espatulada, cartácea a subcoriácea, ápice levemente emarginado, base aguda; estípula lanceolada, persistente, coriácea, ápice truncado, 2,5 a 5 mm de comprimento, sétulas quase eqüilongas entre si, carena pronunciada; de 5 a 15 flores, pedicelo 5 a 11 mm de comprimento e 1 mm de espessura. *E. nanum* ocorre freqüentemente em formações campestres em área de Cerrado como um subarbusto cespitoso de até 0,60 m de altura, muito pouco ramificado, formando touceira com sistema subterrâneo interligado; ramos em ziguezague; pecíolo 2,4 a 4,4 mm de comprimento, 1,2 a 2 mm de espessura; folha 70 a 141 mm x 24 a 50 mm, oblanceolada a espatulada, cartácea a coriácea, ápice obtuso, base cuneada; estípula estreito-triangular a lanceolada, persistente, cartácea a coriácea, ápice agudo, 2,7 a 4 mm de comprimento, sétulas laterais mais longas que a central, carena pouco pronunciada; de 3 a 25 flores, pedicelo filiforme, 10 a 20,5 mm de comprimento, 0,3 a 0,4 mm de espessura.

= *Erythroxylum hasslerianum* Chodat syn. nov.

Erythroxylum hasslerianum Chodat, in Bull. Herb. Boiss. VI Append. 1:15.1898. Lectótipo: E. Hassler nº 3308, Paraguay, Cordilheira de Altos, "in campo silv.", outubro de 1898 K! e F neg. nº 55573!, designado aqui. Isolectótipos: Plowman (*in sched.*) NY! e F neg. nº 55518!, P! e W! Paralectótipos: Hassler nº 2988, Paraguay, Cordilheira de Altos, janeiro de 1898, em A! e F. neg. nº 55517!, K! e F neg. nº 55572!, S e W n.v.

= *Erythroxylum hasslerianum* Chodat f. *angustifolia* Chodat & Hassler syn.nov.

Erythroxylum hasslerianum Chodat f. *angustifolia* Chodat & Hassler, in Bull. Herb. Boiss. IV(2):1288.1904.
Holótipo: E. Hassler nº 6151, Paraguay, "in dumetis prope Tobaty", sept. G! e F neg. nº 60934! Isótipo NY! e F neg. nº 55516!

= *Erythroxylum hasslerianum* Chodat f. *elliptica* Chodat & Hassler syn. nov.

Erythroxylum hasslerianum Chodat f. *elliptica* Chodat & Hassler, in Bull. Herb. Boiss. IV(2):1288.1904.
Holótipo: E. Hassler nº 5773, Paraguay, "in campo San Blas (Yeruti)", dec. G!

= *Erythroxylum deciduum* A. St.-Hil. var. *angustifolium* (Mart.) O. E. Schulz syn. nov.

Erythroxylum deciduum A. St.-Hil. var. *angustifolium* (Mart.) O. E. Schulz, in A. Engl. Pflanzenr. IV.134(29):58.1907.

Basiônimo: *E. nitidum* Mart. var. *angustifolium* Mart., Beitr. *Erythroxylon* 113.1840; Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 3(2):393.1843.

Lectótipo: A. St.-Hil. s.n., s.l.i., .1829, G! e F neg. nº 26395! Aqui indicado.

= *Erythroxylum deciduum* A. St.-Hil. var. *glaucum* (Mart.) O. E. Schulz syn. nov.

Erythroxylum deciduum A. St.-Hil. var. *glaucum* (Mart.) O. E. Schulz, in A. Engl. Pflanzenr. IV.134(29):59.1907.

Basiônimo: *E. nitidum* Mart. var. *glaucum* Mart., Beitr. *Erythroxylon* 113. 1840; Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. 3(2):393.1843.

Holótipo: Pohl nº 2157, Brasil, Rio de Janeiro, Santa Rita, W! e F neg. nº 60016! Isótipo BR!

3. *Erythroxylum pelleterianum* A. St.-Hil., in Fl. Bras. merid. 2:100, tab. 102.1829.

= *Erythroxylum flexuosum* O. E. Schulz syn. nov.

Erythroxylum flexuosum O. E. Schulz, in A. Engl. Pflanzenr. IV.134 (29): 41.1907. Lectótipo (Plowman *in sched.*): C. W. H. Mosén nº 1792, Brasil, São Paulo, Mogi-Mirim, 20 de março de 1874, P, designado aqui. Isolectótipo: S! e F neg. nº 58442! Paralectótipos: Glaziou nº 20224, Brasil, Minas Gerais, s.d. K! e P! Riedel C, Brasil, São Paulo, Mugy, "in fruticetis siccis", 1833, BR! e F neg. nº 58506! Schücht nº 190, Brasil, s.l.i., s.d. W! e F. neg. nº 60015!

Schulz (1907), em seu texto, depois da descrição de *E. pelleterianum*, apresentou duas espécies novas: *E. verruculosum* (indicada como sinônimo de *E. buxus* Peyr. por Mendonça & Amaral Jr., 1999) e *E. flexuosum* que o autor diz ser diferente de *E. verruculosum* por apresentar ramos finos e flexíveis, com 2,8 mm de espessura; córtex nigrescente, subrimoso; catafilos densos e numerosos; pecíolo de 1,5 a 2 mm de comprimento; folha de 47 x 24 mm, base aguda, nervuras laterais na face adaxial evidentes e do retículo impressas; estípula de 2,5 a 3 mm de comprimento, largo-lanceolada, 3-setulosa, margem e ápice fimbriados.

Nos estudos de campo, constatou-se que as diferenças citadas por Schulz (1907) entre *E. flexuosum* e *E. pelleterianum* são devidas ao ambiente. *E. pelleterianum* é de ampla distribuição geográfica, ocorrendo em diversas formações vegetais, e o tamanho da folha, pecíolo e a distribuição dos catafilos não passam de variações normais dentro da espécie.

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8. **Resumo e Abstract**: Usar letras maiúsculas. O Resumo deve ser digitado em texto corrido em um único parágrafo e com cerca de 200 palavras, seguido por palavras-chave. Deve ser um texto conciso, observando-se a coesão e a coerência textuais, envolvendo objetivos, material e métodos, resultados e conclusões. Não deve conter citações bibliográficas, tampouco informações que não se encontram no texto do artigo. As mesmas regras aplica-se ao Abstract, escrito em inglês e seguido de palavras-chave. Observar que o Abstract, em inglês, deverá ser sempre obrigatório, sendo que Resumos em outros idiomas, à exceção do português, deverão ser omitidos.
9. **Introdução**: Revisão do conhecimento pertinente e objetivos do trabalho.
10. **Material e Métodos**: Deverá conter descrições breves, suficientes à repetição do

trabalho; técnicas já publicadas devem ser citadas e não descritas.

11. **Resultados:** Devem expressar explicitamente os dados e informações coletadas sem tentativas de explicar tendências. Em relação a trabalhos taxonômicos e de flora temos algumas considerações a fazer: a citação deve incluir a seguinte ordem, observando-se a forma de escrever: país (negrito e caixa alta), estado (negrito) e cidade, data (o mês em algarismos romanos), estado fenológico (quando possível determinar), nome e número do coletor (itálico) e a sigla do herbário. No caso de mais de três coletores, citar o primeiro seguido de et al. Ex.: **BRASIL. Distrito Federal**: Brasília/XII.1998, fl. Fr., *G.M. Garcia 356* (HEPH).

    Chaves de identificação devem ser identadas. Nomes dos autores dos *taxa* não deve aparecer. Os *taxa* da chave, quando tratados no texto, devem aparecer em ordem alfabética. Exemplo:

    1. Plantas lenhosas
        2. Flores lilacíneas ..... ***P. scutatum***
        2. Flores alvas ..... ***P. ellipticum***
    2. Plantas herbáceas
        3. Flores pecioladas
            4. Fruto oblongo ..... ***P. splendens***
            4. Fruto linear ..... ***P. stelatum***
        3. Flores sésseis

    Autores de nomes científicos devem ser citados de forma abreviada, de acordo com índice taxonômico do grupo em pauta (Brummit & Powel, 1992, para Fanerógamos). Obras "*princeps*" devem ser citadas de forma abreviada.

12. **Discussão**: Baseando-se no conhecimento anterior, apontado na Introdução e Material e Métodos, bem como nas observações pessoais inéditas do(s) autor(es) no trabalho em consideração, deve-se analisar os resultados apresentados e consubstanciá-los em uma conclusão, sempre que possível, de modo a propiciar o desenvolvimento da área relacionada ao trabalho.

    Resultados e Discussão podem ser acompanhados de Tabelas e de Figuras, estritamente necessárias à compreensão do texto. As Tabelas e as Figuras devem ser numeradas em séries independentes umas das outras, em algarismos arábicos e suas legendas devem ser apresentadas em folhas separadas, no fim do texto original e três cópias para Figuras. As Figuras devem ter no máximo duas vezes o seu tamanho final de duplicação. A área útil para elas, incluindo legenda é de 12 cm de largura por 18 cm de altura. Poderão ser feitas em tinta nanquim ou em aplicativos do Windows, devendo conter escala. Números e letras devem ter tamanho adequado para manter a legibilidade quando reduzidos. As letras devem ser colocadas abaixo e à direita do desenho. As Tabelas e Figuras devem ser referidas no texto por extenso com a inicial maiúscula.

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    Universidade de Brasília (UnB), Herbário Ezechias Paulo Heringer (HEPH).

    Usar unidades de medidas apenas de forma abreviada. Exemplos:

    11 cm, 2,4 mm; 25,0 cm^3; 30 $g.cm^{-3}$.

Escrever por extenso os números de um a dez (não os maiores), a menos que sejam uma medida ou venha em combinação com outros números. Exemplo:
quatro árvores; 6 mm;12 amostras; 5 pétalas e 10 sépalas.
Subdivisões dentro de Material e Métodos ou de Resultados devem ser escritas em letras minúsculas seguidas de um traço e do texto na mesma linha. A Discussão deve incluir as Conclusões.

1. **Citações bibliográficas**: Os autores devem evitar trechos entre aspas. As citações bibliográficas no texto devem incluir o sobrenome do autor e o ano de publicação; dois autores serão unidos pelo símbolo &; para mais de dois autores citar só o primeiro seguido de "et al." Para artigos do mesmo autor, publicados num mesmo ano, colocar letras minúsculas em ordem alfabéticas após a data, em ordem de citação no texto. Citações dentro dos mesmos parênteses devem ser feitas em ordem cronológica. Citações não consultadas no original deverão ser referidas usado-se "citado por". Exemplo: Barbosa (1820 citado por Peters,1992) ou (Barbosa, 1820 citado por Peters,1992). No item Referências bibliográficas, deve-se citar apenas obras consultadas. Aceitam-se apenas citações de trabalhos efetivamente publicados. Excepcionalmente, poderão ser aceitas citações de teses, dissertações e monografias, quando as informações nelas contidas não estiverem ainda publicadas, e trabalhos no prelo, desde que conste a citação da revista ou livro.

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Boletim do Herbário Ezechias Paulo Heringer

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A preliminary floristic and phytogeographic analysis of the woody flora of seasonally dry forests in northern Peru

SAMUEL BRIDGEWATER, R. TOBY PENNINGTON
CARLOS A. REYNEL, ANICETO DAZA
& TERRENCE D. PENNINGTON

ABSTRACT

BRIDGEWATER, S., R. T. PENNINGTON, C. A. REYNEL, A. DAZA & T. D. PENNINGTON (2003). A preliminary floristic and phytogeographic analysis of the woody flora of seasonally dry forests in northern Peru. *Candollea* 58: 129-148. In English, English and French abstracts.

Inventory data and general woody floristic lists are presented for northern Peruvian seasonally dry tropical forests (SDTFs). These preliminary data record ca. 250 woody species for the SDTFs around Tumbes, the inter-andean valleys and around Tarapoto. High levels of endemism are shown in these SDTFs, with between 13-20% of their tree species recognised as narrow regional endemics. A comparison of disjunct SDTF patches on the Pacific coast, in the Marañon drainage and around Tarapoto reveals only low floristic similarity (ca. 2-10%) between them, suggesting considerable barriers to species movement. Present day barriers are represented by the Eastern and Western Andean Massifs. However, an examination of the disjunct species distribution patterns suggest that either species migration between the Marañon drainage and the Pacific region over the Andes has recently occurred via the Porculla Gap, or these areas were once continuous before the uplift of the Andes. A comparison of Peruvian dry forest plot data with inventories from southern Ecuador and Bolivia indicates that the northern Peruvian Tumbes and Marañon dry forests, and those of southern Ecuador may constitute a distinct phytogeographical unit.

RÉSUMÉ

BRIDGEWATER, S., R. T. PENNINGTON, C. A. REYNEL, A. DAZA & T. D. PENNINGTON (2003). Analyse floristique et phytogéographique préliminaire de la flore ligneuse des forêts saisonnières sèches du nord du Pérou. *Candollea* 58: 129-148. En anglais, résumés anglais et français.

Des inventaires et des listes floristiques des espèces ligneuses sont présentés pour la région des forêts tropicales saisonnières sèches du nord du Pérou (SDTFs). Ces données préliminaires portent sur 250 espèces ligneuses pour les SDTFs aux alentours de Tumbes, dans les vallées interandines et aux alentours de Tarapoto. Des hauts niveaux d'endémisme sont signalés, avec entre 13-20% des espèces ligneuses strictement endémiques de la région. Une comparaison d'aires de SDTF disjointes sur la côte du Pacifique, sur le versant du Marañon et aux alentours de Tarapoto, révèle une faible ressemblance floristique (ca. 2-10%) entre elles, suggérant des barrières importantes au déplacement des espèces. Ces barrières sont aujourd'hui représentées par les Massifs Andins Est et Ouest. Néanmoins, une étude des schémas de distribution disjointe des espèces suggère que, soit que la migration des espèces entre le verssant du Marañon et la région du Pacifique, par dessus les Andes, a eu lieu via l'Abra de Porculla, soit que ces régions ont été autrefois continues avant le soulévement des Andes. Une comparaison des données en provenance de parcelles de forêts sèches péruviennes avec celles d'inventaires faits au Sud de l'Equateur et de la Bolivie indique que les forêts sèches du Nord du Pérou (Tumbes et Marañon) et celles du Sud de l'Equateur pourraient constituer une unité phytogéographique particulière.

KEY-WORDS: Seasonally dry tropical forests – Peru – Phytogeography – Neotropical – Andes.

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Introduction

In recent years there has been an increase in research into South American SDTFs and their neglected floras (e.g. PRADO, 1991; PRADO & GIBBS, 1993; GENTRY, 1995; KESSLER & HELME, 1999; PENNINGTON & al., 2000). The stimulus for this research results from the realisation that as well as this ecosystem being one of the most threatened in the continent (JANZEN, 1988), a study of their floras may elucidate patterns of historical vegetation change (e.g. PRADO & GIBBS, 1993). From species distribution studies, PRADO & GIBBS (1993) suggested that the disjunct SDTF patches that are found today represent fragments of what may have been a larger area of dry forest ranging through the continent during the last glacial maximum – a 'Pleistocene Arc' of dry vegetation.

In this paper we adopt the broad definition of SDTF outlined by PENNINGTON & al. (2000). SDTFs are tree-dominated ecosystems, the vegetation being mostly deciduous during the dry season. In South America they occur on relatively fertile soils where rainfall is less than 1600 mm/year and where there is a strongly defined dry season with at least 5-6 months of the year receiving less than 100 mm (GENTRY, 1995; GRAHAM & DILCHER, 1995). This is in marked contrast to tropical rain forests which occur in wetter climatic regimes, with every month showing more than 100 mm of rainfall (WHITMORE, 1998). They differ from tropical savannas, which may also have a well developed woody component, in that they lack the savanna's usually continuous xeromorphic fire resistant grass layer (MOONEY & al., 1995). In addition, although savannas are found under similar or slightly wetter climatic conditions, they tend to be on poorer soils (SARMIENTO, 1992).

The largest expanses of SDTF in South America (Fig. 1) are found in north-eastern Brazil (the 'caatingas'), in two areas defined by PRADO & GIBBS (1993) as the 'Misiones' and 'Piedmont' nuclei, and on the Caribbean coasts of Colombia and Venezuela. Other smaller and more isolated areas occur in dry valleys in the Andes of Bolivia, Peru, Ecuador, and Colombia, coastal Ecuador and northern Peru, the 'Mato Grosso de Goiás' in Central Brazil and scattered throughout the Brazilian cerrado biome on areas of fertile soils. In Central America, SDTFs are concentrated along the Pacific coast from Guanacaste in northern Costa Rica, to just north of the Tropic of Cancer in the Mexican state of Sonora.

Historically, SDTFs have received relatively little attention from conservationists and ecologists relative to that given to rain forests (JANZEN, 1988; MOONEY & al., 1995), despite the fact that they are far more threatened. Less than 2% of seasonally dry forests on the Pacific coast of Mesoamerica, for example, are still intact (JANZEN, 1988). The primary reason for the massive destruction of this ecosystem is the fertile nature of its soil which is prized for agriculture (RATTER & al., 1978). Its destruction is exacerbated by the large human populations in many Neotropical dry forest life zones (MURPHY & LUGO, 1995). Floristically they are still poorly described, and although a number of authors have made floristic comparisons (e.g. PRADO & GIBBS, 1993; KESSLER & HELME, 1999; SARMIENTO, 1975), much remains to be understood about patterns of floristic diversity between the many disjunct dry forest patches. This lack of botanical research in part reflects their relatively depauperate flora (ca. 30 tree species ≥10 cm/hectare), when compared with the rain forest (ca. 120 species ≥10 cm /hectare).

There is very little floristic information available for the few remaining SDTF areas in Peru. This work seeks to provide detailed floristic data for two inter-Andean SDTFs in northern Peru, and to assess their floristic affinities. The data presented are important in two contexts: (i) Peruvian inter-Andean valleys have been proposed as a historical migration route between SDTFs in southern and northern South America, and therefore their floristic affinities are of particular biogeographic interest; (ii) At present only two significant patches of Peruvian SDTF (Coto de Caza El Angolo and Cerros de Amotape), have any form of protection (neither of which occur in the inter-Andean valleys), and an assessment of whether other SDTF areas also merit conservation is necessary.

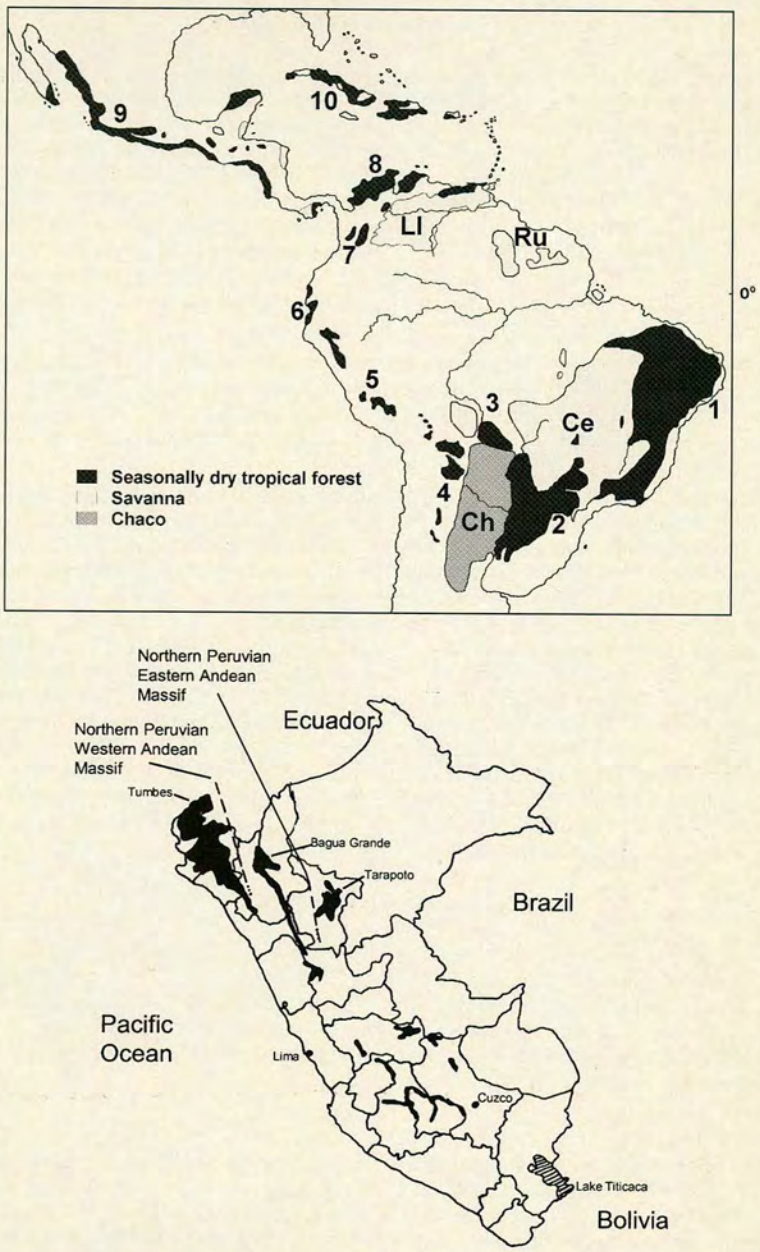


Fig. 1. – The distribution of seasonally dry vegetation in the Neotropics. ***Seasonally dry forests:*** **1,** Caatingas; **2,** Misiones Nucleus; **3,** Bolivian Chiquitano region; **4,** Piedmont Nucleus; **5,** Bolivian and Peruvian InterAndean valleys; **6,** Pacific coastal Ecuador; **7,** Colombian InterAndean valleys; **8,** Cribbean coast of Colombia and Venezuela; **9,** Central America; **10,** Antilles. ***Savannas:*** **Ce,** Cerrado; **Ll,** Llanos; **Ru,** Rupununi; **Ch,** Chaco.

[Reproduced from PENNINGTON & al. (2000). *J. Biogeogr.* 27: 62. Blackwell Publishing.]

Site description and methods

Peru is the third largest South America country, covering almost 1.3 million square kilometers, and floristically can be roughly divided into three zones – the eastern Amazonian region, the mountainous Andean region and the coastal region, a narrow desert strip along the Pacific coast. SDTF patches occur within each of these three primary regions (Fig 1), occurring as a mosaic with other vegetation formations in Tumbes (bordering Ecuador), the inter-Andean valleys of Cajamarca and Amazonas (most significantly the Marañon valley), around Tarapoto and the Rio Huallaga and around Cuzco. In total the extension of these forests areas was originally ca. 44,600 km^2 (Ministerio de Agricultura, 1994), this area including a range of different SDTF types including lowland, montane, and semi-arid dry forest systems. However, the majority of seasonally dry forests have long since been cleared for agriculture, and intact patches only exist in small, discrete and usually heavily disturbed fragments.

Quantitative plot-based surveys were focused on two distinct SDTF areas, lying on either side of the Eastern Andean massif (Fig. 1). The first and most westerly site lies 25 km from Bagua Grande (Dept. of Amazonas) on the road to Chachapoyas (06°31'S, 76°22'W), with the second site east of the Eastern Andean Massif, 25 km from Tarapoto (Dept. of San Martín) on the road to Juanjui (5°51'67"S, 78°13'56"W).

At each area 10 × 50 m plots were marked out, with five plots (0.25 hectare) surveyed at Bagua Grande, and four contiguous plots (0.2 hectare) at Tarapoto. The areas surveyed at each site were constrained by the available area of reasonably undisturbed SDTF, this formation having been decimated in both areas. For each plot, all trees ≥5 cm dbh were identified and their diameter at breast height (dbh) and total height were recorded. In addition general collections were made in the vicinity of each survey to complement the plot species lists. General qualitative species lists (from general observation and collecting) were also compiled on the journey to the survey sites, the most in depth of which were in dry forest fragments on the Pacific slope of the Western Andean Massif between Olmos and Limón (05°55'S, 78°33'W), and on a hill close to Chamayo (05°53'S, 78°46'W). Fieldwork was conducted in two phases: a three week period in March 1998 at Bagua Grande, and a three week period in November 2000 at Bagua Grande and Tarapoto. Collections were made in sets of four. All collections are held at the Universidad Nacional Agraria La Molina (MOL), and duplicate sets of the March 1998 collections have been distributed to Missouri Botanical Garden (MO), the Royal Botanic Gardens, Kew (K), and the Royal Botanic Garden Edinburgh (E).

Results & Discussion

A total of 409 collections were made in the SDTF areas, representing 237 woody taxa. Of these, 171 were identified to species, 48 to genus and 18 to family. Full species lists from the plots and those derived from general collections around the SDTF formations are given in Appendix 1. A total of 26 tree species ≥5 cm dbh were recorded in the seasonally dry forest plot at Bagua Grande and 31 tree species from the plot at Tarapoto. Phytosociological data for both sites is provided in Tables 1, 2, 3 and 4.

Diversity

SDTFs are species-poor compared to tropical rain forests, and their flora, with a few exceptions, can be considered depauperate versions of the latter, with the majority (but not all) of the families and genera shared between them. GENTRY (1995) records that lowland SDTF forest areas typically have between 50 – 70 species (≥2.5 cm dbh) in 0.1 hectare, the average species richness for this class and sample size being 65. This is under half the species richness found in an equivalent area of lowland rain forest. For trees ≥ 10cm dbh, the diversity of lowland SDTF is between 20 and 30 species. Both the dry forest plots of the present survey appear to be of average diversity when compared to other inventoried areas in South America, with 18 species ≥10 cm dbh recorded in 0.25 hectares of forest at Bagua Grande, and 24 species from 0.2 hectares ≥10 cm dbh recorded at Tarapoto.

Table 1. – Phytosociological data for the 0.25 hectare dry forest plot 20km from Bagua Grande on the road to Chachapoyas. Species ordered by IVI

Species	*Family*	*Density*			*Dominance*		*Frequency*		*IVI*
		Ind.	*Aden.*	*Rden.*	*Ado.*	*RelD.*	*Afre.*	*Relfre.*	
Cordia iguaguana I. M. Johnst.	Boraginaceae	111	444	31.62	4.61	23.49	100	6.85	61.97
Hura crepitans L.	Euphorbiaceae	24	96	6.84	4.24	21.64	100	6.85	35.33
Ceiba insignis (Kunth) Gibbs & Semir	Bombacaceae	7	28	1.99	4.62	23.55	80	5.48	31.03
Praecereus euchlorus K. Schum.	Cactaceae	55	220	15.67	0.70	3.58	60	4.11	23.36
Rauhocereus riosariensis Backeb.	Cactaceae	31	124	8.83	0.52	2.64	100	6.85	18.32
Nyctaginaceae (RTP747)	Nyctaginaceae	14	56	3.99	0.86	4.38	80	5.48	13.85
Erythroxylum aff. *deciduum* A. St.-Hil.	Erythroxylaceae	17	68	4.84	0.39	1.97	80	5.48	12.29
Piptadenia viridiflora (Kunth) Benth.	Leguminosae	7	28	1.99	0.62	3.17	60	4.11	9.27
Zanthoxylum sp. (RTP748)	Rutaceae	9	36	2.56	0.23	1.18	80	5.48	9.22
Zanthoxylum rigidum Willd.	Rutaceae	5	20	1.46	0.45	2.28	80	5.48	9.19
Capparis guayaquilensis Kunth	Capparaceae	5	20	1.42	0.16	0.84	80	5.48	7.74
Acacia tortuosa (L.) Willd.	Leguminosae	13	52	3.70	0.23	1.17	40	2.74	7.61
Ruprechtia aperta Pendry	Polygonaceae	7	28	1.99	0.21	1.07	60	4.11	7.17
Capparis petiolaris Kunth	Elaeocarpaceae	6	24	1.71	0.12	0.60	60	4.11	6.42
Celtis loxensis C. C. Berg	Ulmaceae	3	12	0.85	0.25	1.26	60	4.11	6.22
Geoffrea spinosa Jacq.	Leguminosae	3	12	0.8506	0.49	2.51	40	2.74	6.10
Croton sp. (RTP964)	Euphorbiaceae	5	20	1.42	0.07	0.38	60	4.11	5.91
Cyathostegia mathewsii (Jacq.) Benth.	Leguminosae	6	24	1.71	0.10	0.53	40	2.74	4.97
Unknown sp. (RTP966)	Unknown	8	32	2.28	0.12	0.62	20	1.37	4.27
Pithecellobium excelsum (Kunth) Benth.	Leguminosae	4	16	1.14	0.07	0.33	40	2.74	4.21
Acacia polyphylla DC.	Leguminosae	3	12	0.85	0.09	0.45	40	2.74	4.05
Eriotheca ruizii (K. Schum.) A. Robyns	Bombacaceae	2	8	0.57	0.21	1.05	20	1.37	2.99
Salacia sp.	Hippocrateaceae	2	8	0.57	0.13	0.66	20	1.37	2.60
Aspidosperma cf. *parvifolium* A. DC.	Apocynaceae	2	8	0.57	0.10	0.51	20	1.37	2.45
Euphorbiaceae sp.	Euphorbiaceae	1	4	0.28	0.02	0.08	20	1.37	1.73
Bouganvillea sp. (RTP991)	Nyctaginaceae	1	4	0.28	0.01	0.07	20	1.37	1.72
TOTALS		**351**	**1404**	**100**	**19.61**	**100**		**100**	**300**

Ind. = number of individuals recorded in the plot; **Aden.** = absolute density (no. of trees/hectare); **Rden.** = relative density; **Ado.** = absolute dominance (basal area/hectare); **RelD.** = relative dominance; **Afre.** = absolute frequency (%); **Relfre.** = relative frequency; **IVI** = rel. density + rel. dominance + rel. frequency.

Table 2. – Phytosociological data for the 0.4 hectare dry forest plot on Hacienda Sr. Rafael Linares Bensimón, 25km from Tarapoto on the road to Juanjui. Species ordered by IVI.

Species	*Family*	*Density*			*Dominance*		*Frequency*		*IVI*
		Ind.	*Aden.*	*Rden.*	*Ado.*	*RelD.*	*Afre.*	*Relfre.*	
Manilkara bidentata (A. DC.) Chev.	Sapotaceae	33	165	16.84	5.5135	38.36	100	5.06	60.26
Schinopsis peruvianum Engl.	Anacardiaceae	3	15	1.53	2.7293	18.99	75	3.80	24.32
Trichilia ulei C. DC.	Meliaceae	17	85	8.67	0.8191	5.70	100	5.06	19.44
Maytenus cf. *macrocrapa* (Ruiz & Pav.) Briq.	Celastraceae	15	75	7.65	0.3700	2.57	100	5.06	15.29
Maytenus sp. (S2784)	Celastraceae	15	75	7.65	0.2632	1.83	100	5.06	14.55
Rheedia spruceana Engl.	Clusiaceae	8	40	4.08	0.7351	5.12	100	5.06	14.26
Trichilia elegans A. Juss.	Meliaceae	10	50	5.10	0.2871	2.00	100	5.06	12.16
Erythroxylum cf. *ulei* O. E. Schultz	Erythroxylaceae	10	50	5.10	0.1987	1.38	100	5.06	11.55
Euterpe sp.	Palmae	8	40	4.08	0.4116	2.86	75	3.80	10.74
Sorocea sp. (S2799)	Moraceae	7	35	3.57	0.3618	2.52	75	3.80	9.89
Capparis quina J. F. Macbr.	Capparaceae	8	40	4.08	0.2161	1.50	75	3.80	9.38
Simira rubescens (Benth.) Steyerm.	Rubiaceae	5	25	2.55	0.1776	1.24	100	5.06	8.85
Drypetes sp. (S2779)	Euphorbiaceae	5	25	2.55	0.5388	3.57	50	2.53	8.83
Triplaris cf. *peruviana* C. A. Mey.	Polygonaceae	7	35	3.57	0.1139	0.79	75	3.80	8.16
Coccoloba sphaerococca Lindau	Polygonaceae	6	30	3.06	0.1194	0.83	75	3.80	7.69
Capparis sp. (S2787)	Capparaceae	6	30	3.06	0.1681	1.17	50	2.53	6.76
Cereus hexagonus / *C. jamacaru* complex	Cactaceae	4	20	2.04	0.2952	2.05	50	2.53	6.63
Clusia sp. (S2790)	Clusiaceae	3	15	1.53	0.1434	1.00	75	3.80	6.33
Coccoloba scandens Casar.	Polygonaceae	3	15	1.53	0.0954	0.66	75	3.80	5.99
Sideroxylon obtusifolium (Roem. & Schult.) T. D. Penn.	Sapotaceae	3	15	1.53	0.1429	0.99	50	2.53	5.06
Praecereus euchlorus K. Schum.	Cactaceae	4	20	2.04	0.2054	1.43	25	1.27	4.74
Urera elata (Sw.) Griseb.	Urticaceae	3	15	1.53	0.0852	0.59	50	2.53	4.66
Alseis peruvianum Standl.	Rubiaceae	2	10	1.02	0.0805	0.56	50	2.53	4.11
Amyris pinnata Kunth	Rutaceae	2	10	1.02	0.0585	0.41	50	2.53	3.96
Neea sp. (S2798)	Nyctaginaceae	2	10	1.02	0.0334	0.23	50	2.53	3.78
Celtis aff. *pubescens* Humb. & Bonp.	Ulmaceae	2	10	1.02	0.0868	0.60	25	1.27	2.89
Rhamnus sp. (S2752)	Rhamnaceae	1	5	0.51	0.0475	0.33	25	1.27	2.11
Cordia sp. (S2803)	Boraginaceae	1	5	0.51	0.0318	0.22	25	1.27	2.00
Platymiscium pinnatum (Jacq.) Dugand	Leguminosae	1	5	0.51	0.0141	0.10	25	1.27	1.87
Casearia sylvestris Sw.	Flacourtiaceae	1	5	0.51	0.0141	0.10	25	1.27	1.87
Randia sp. (S2795)	Rubiaceae	1	5	0.51	0.0141	0.10	25	1.27	1.87
TOTALS		**196**	**980**	**100**	**14.372**	**100**		**100**	**300**

Ind. = number of individuals recorded in the plot; **Aden.** = absolute density (no. of trees/hectare); **Rden.** = relative density; **Ado.** = absolute dominance (basal area/hectare); **RelD.** = relative dominance; **Afre.** = absolute frequency (%); **Relfre.** = relative frequency; **IVI** = rel. density + rel. dominance + rel. frequency.

Table. 3. – Importance value indices (IVI) for the dry forest families found in the Bauga Grande plot.

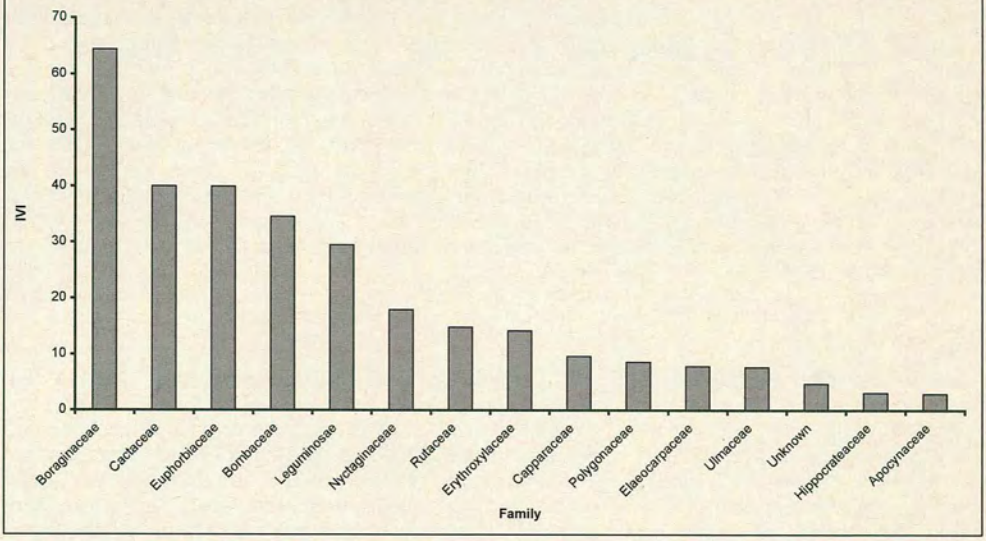
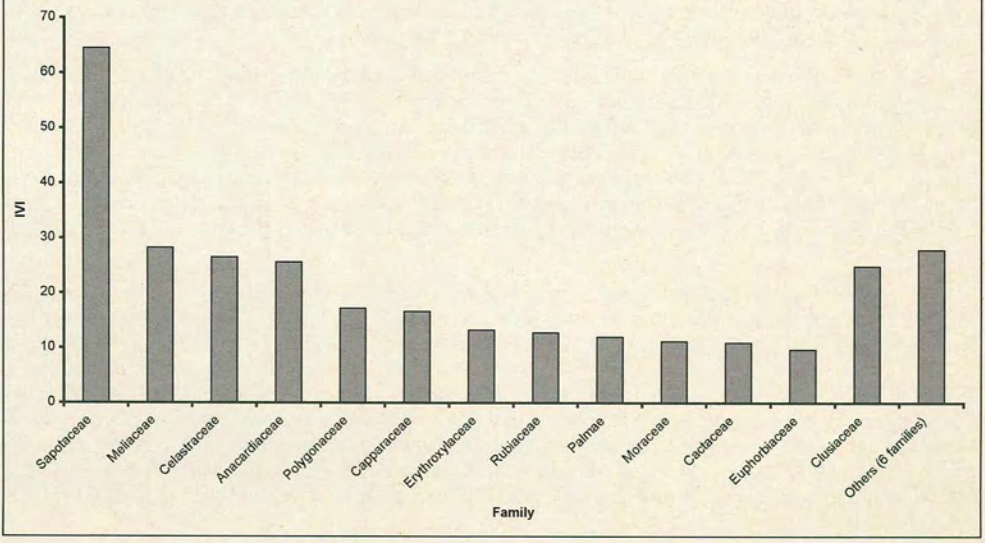


Table. 4. – Importance value indices (IVI) for the dry forest families found in the Tarapoto plot.



The Catalogue of Flowering Plants and Gymnosperms of Peru (BRAKO & ZARUCCHI, 1993) records 17,143 species of flowering plants and gymnosperms as occurring in the country – ca. 6 % of the world total. The plant species diversity of the three departments of northern Peru visited in the present survey is high because of the huge range of topography and climate to be found within them – Cajamarca, Amazonas and San Martín have 2699, 3474 and 3827 species of higher plants respectively (ALVA & al., 1999). In the present survey, general collecting carried out within the SDTFs and closely allied formations recorded a total of 55 species (not including lianas) for Cajamarca, 100 for those of Amazonas (45 of which were recorded inside the 0.25 hectare plot) and 89 species for the SDTF found at Tarapoto (29 of which were inside the plot). Although our rapid surveys concentrated upon woody plants, and certainly do not represent an exhaustive inventory of the woody flora of these areas, these figures strongly indicate that the SDTFs are species poor, and make up a relatively small proportion of the total diversity for the region.

Phytosociology

Structurally, SDTF plots are very variable, typically showing between 310 and 860 trees/hectare (trees ≥10 cm dbh) and a basal area of between 13 and 57 m2/hectare (GENTRY, 1995). Both the forest plots of the current survey fall close to the lower density values recorded for dry forests with 352 and 440 individuals/hectare recorded for Bagua Grande and Tarapoto respectively. Likewise, the basal areas of both sites were relatively low, the Bagua Grande forest plot having a basal area of 14.25 m^2/hectare (≥10 cm dbh) and the Tarapoto plot 12.49 m^2/hectare (≥10 cm dbh). These low levels may reflect disturbance and past removal of important tree species.

Two plant families which tend to dominate South American SDTFs and which are represented by the most species are the *Leguminosae* and the *Bignoniaceae* (GENTRY, 1995). Significantly, however, neither of these two families dominated the study plots. The *Bignoniaceae* was absent from the tree flora of both sites (but would have been important in the liana element), although a species of *Tabebuia* was observed as a seedling at Bagua Grande, and trees of the same genus were commonly observed in the surrounding area. The bigger stems of *Tabebuia* were removed from the Bagua Grande plot by logging, the wood being highly prized locally. One of the authors (A. Daza) remembers *Tabebuia* being common in the region in the 1960s and 1970s, and cut stems were indeed occasionally observed in the area. *Tecoma*, the only other woody genus of this family recorded (as a shrub) was relatively abundant in the general Amazonas and Cajamarca area although was not present in the plots.

The *Leguminosae* was the most speciose family at the Bagua Grande site (6 out of 26 species), although in terms of the Importance Value Index (IVI) the family was not as dominant as one might expect, being ranked fifth after the *Boraginaceae*, *Cactaceae*, *Euphorbiaceae* and *Bombacaceae*. These families were represented by relatively few species (1, 2, 2 and 2 respectively), with the *Euphorbiaceae* and *Bombacaceae* both represented primarily by a few very large trees. Most notable of these were *Hura crepitans* (*Euphorbiaceae*), *Ceiba insignis* and *Eriotheca ruizii* (*Bombacaceae*). *Cordia iguaguana* (*Boraginaceae*), dominated the forest (in terms of IVI) at Bagua Grande.

Surprisingly, within the Tarapoto plot only one legume individual with a dbh ≥5 cm was recorded – *Platymiscium pinnatum*. This is a widespread generalist species occurring from Costa Rica down to Bolivia (KLITGAARD, 1999). At this site the four most important families (in terms of IVI) were the *Sapotaceae* (*Manilkara* and *Sideroxylon*), *Meliaceae* (*Trichilia* spp.), *Celastraceae* (*Maytenus*) and *Anacardiaceae* (*Schinopsis*). The commonest species by far recorded in this plot (accounting for a fifth of the total IVI) was *Manilkara bidentata*, a species widespread across northern S. America, and an ecological generalist occurring in both dry and wet forest habitats. The two next most important species as assessed by IVI were *Schinopsis peruvianum* and *Trichilia ulei*. Both are endemic to the Tarapoto area (MEYER & BARKLEY, 1973; PENNINGTON & al., 1981).

The three families commonly cited as being of greater significance in SDTF than in rain forests – the *Capparaceae*, *Cactaceae* and *Erythoxylaceae*, were all represented in the two dry forest plots surveyed, although by relatively few species in all cases. However, the *Cactaceae*, although only represented by two (totally different) species at each site, were extremely conspicuous components of the vegetation – especially at Bagua Grande where 25% (86) of all individuals with a dbh ≥5cm, belonged to this family.

Two genera which are classically associated with seasonally dry forests – *Capparis* (*Capparaceae*) and *Ruprechtia* (*Polygonaceae*) were present at the sites, with *Capparis petiolaris* recorded in the Bagua Grande plot, and *C. quina* at Tarapoto. One species of *Ruprechtia* (*R. aperta* – a regional endemic) was recorded from Bagua Grande. In the general area around Jaén and Bagua Grande, *Capparis* was extremely common (most frequently observed were *C. guayaquilensis* and *C. scabrida*, the latter being also common in the Loja province of southern Ecuador (G. Lewis, pers. comm.), and together with cacti and *Cordia* (in particular *C. lutea*) were the most conspicuous elements of the thorny dry forest scrub that covered much of the area around the remaining patches of SDTFs.

At the generic level, in addition to *Capparis*, GENTRY (1995) lists the most common South American dry forest genera as *Tabebuia*, *Cordia*, *Casearia*, *Bauhinia*, *Trichilia*, *Erythroxylum*, *Randia*, *Hippocratea*, *Serjania*, *Croton* and *Zanthoxylum*. With the exception of *Hippocratea* and *Serjania* (which were not recorded as present in the plots, although as both are usually found as vines they may have been present but not noted) all of these genera were present in at least at one of the two sites.

At the generic level, both structurally and floristically, despite certain anomalies, both of the study sites can be considered as classic South American SDTF areas, with the majority of the expected families and genera represented. It is at the species level, however, that the real interest of these dry forest fragments is to be found.

Endemism

ALVA & al. (1999) state that the levels of endemism in northern Peru as a whole are extremely high, with more than 715 species and 11 genera recognised as endemic. Taking a close look at the current dry forest plot data, the component flora comprises species belonging to three broad categories: Geographically widespread species with a wide ecological tolerance; widespread species restricted to dry forests; dry forest regional endemics.

Approximately 20% of the flora of the Bagua Grande plot is composed of species endemic to the SDTF of northwestern Peru and southern Ecuador (5 out of 26 species). Of the succulents, the cactus *Rauhocereus riosaniensis* is a narrowly restricted endemic species of northern Peru (TAYLOR, pers. comm., 2001), whereas the other cactus present (*Praecereus euchlorus*) is a widespread classic Peistocene Arc species (*sensu* PRADO & GIBBS, 1993). However, the form found at Bagua Grande (subsp. *jaenensis*) is endemic to northern Peru. The region of the Marañon valley is rich in cactus endemics, which may reflect that it is close to the ancestral area of the *Cactaceae* (N. TAYLOR, pers. comm., 2001). Of the woody element, a further three species are narrow SDTF endemics. *Ruprechtia aperta* (*Polygonaceae*) is restricted to the Marañon drainage basin and Pacific slopes of the Western Andean Massif (PENDRY, pers. comm., 2002), *Cyathostegia mathewsii* (*Leguminosae*) to northern Peru and southern Ecuador (IRELAND, 2001) and *Pithecellobium excelsum* (*Leguminosae*) to semi-deciduous thorn scrub and woodland from SW Ecuador and NW Peru (BARNEBY & GRIMES, 1997). In addition, *Celtis loxensis* (*Ulmaceae*) is endemic to dry forest areas of SW Ecuador and NW Peru (BERG & DAHLBERG, 2001). The remainder appear to be of more widespread distribution. These include *Geoffrea spinosa* (a dry forest Pleistocene Arc species), *Aspidosperma parvifolium* (a generalist found across S. America), *Hura crepitans* (an ecological generalist of northern S. America), *Eriotheca ruizii* (restricted to dry vegetation of the Pacific coast of Ecuador and northern Peru (ROBYNS, 1963)) and *Ceiba insignis*, a polymorphic complex widespread across S. America (GIBBS & al., 1988). *Zanthoxylum rigidum* is a widespread species occurring in both dry and humid forest systems from Paraguay to Colombia, and *Piptadenia viridiflora* is found across S. America.

For the Tarapoto plot, a similar pattern can be seen, with three of the 31 species (ca. 10%) being narrow endemics to the Tarapoto area. Of these, *Schinopsis peruvianum*, *Trichilia ulei* and *Triplaris peruviana* are endemic to the Tarapoto area and the Rio Huallaga (MEYER & BARKLEY, 1973; PENNINGTON & al., 1981; BRANDBYGE, 1986). Outside the plot, other endemic species were found including *Platymiscium gracile*, *Lecointea* cf. *peruviana* and *Inga tenuicalyx*. The remainder of the flora is made up from wide ranging species including *Trichila elegans*, *Manilkara bidentata*, *Platymiscium pinnatum, Rheedia spruceana*, *Cereus* sp. (*C. hexagonus/C. jamacaru* complex), *Sideroxylon obtusifolium*, *Casearia sylvestris* and *Praecereus euchlorus*.

Phytogeography

Our data indicate very low floristic similarity between the Bagua Grande and Tarapoto plots. Only one species is shared (*Praecereus euchlorus* – although represented at each site by a different subspecies) and four genera (*Cordia*, *Erythroxylum*, *Capparis* and *Praecereus*). Even with general collecting outside of the plots in both dry forest areas in the Tarapoto and Marañon basin areas (and including inventory data collected by GENTRY (Missouri Botanical Garden Website) in Tarapoto), only four species (*Bauhinia glabra*, *Colubrina* cf. *retusa*, *Platymiscium pinnatum* and *Sideroxylon obtusifolium*) are found to be in common between the dry forest formations of these regions – a similarity of only 2% (out of a total of 198 species recorded for the two areas).

This floristic dissimilarity may reflect strong present-day geographical barriers between the two SDTF sites, represented by the Eastern Andean Massif, which is covered in mesic forest. These particular STDF fragments have not been linked in a single uniform block in recent geological history because the Andean uplift occurred during the Miocene, between 23 and 5 million years BP [before present] (BURNHAM & GRAHAM, 1999).

The SDTF of Tumbes, on the Pacific slope of the Andes, and the Marañon basin are separated from one another by the similarly substantial barrier of the Western Andean Massif. In one area, however, recent migration of SDTF species may have been possible. This is via the Porculla Gap – which represents the lowest pass (only 2000 m) over the entire Andean chain. The SDTF of the Marañon basin and that of Tumbes are separated by only a narrow band of mesic montane vegetation over the Porcuya gap, representing a horizontal distance of 10 km, and an altitudinal barrier of ca. 600 m (personal observations; the main highway to our study sites runs through the Porcuya gap).

A species list (179 species in total) for the dry forest area Coto de Caza El Angolo (TRIGOSO, 1989) which lies south of Tumbes in Peru near the Pacific coast, reveals that 10 species (representing 10% of the flora) are in common with the SDTFs of the Marañon drainage (as compiled through the present study), of which three species (*Eriotheca ruizii*, *Leucaena trichodes* and *Pithecellobium excelsum*) were recorded in the plots as Bagua Grande. This equates to 6.5% of the plot flora in common. This suggests a greater potential for migration, perhaps through the Porculla gap, and is indicated by greater floristic similarity between the STDF of Tumbes and that of the Marañon valley than that found for the comparison of the SDTF of Marañon and Tarapoto. Overall similarity, however, is still low, indicating that the western Andean chain still acts as a considerable barrier. There are two explanations for these shared distribution patterns. Either there has been movement of species across the Western Andean Massif via the Porcuya Gap, or their present disjunction is due to the Andes uplift splitting a former more continuous distribution pattern.

Further data for SDTF on the Pacific side of the Peruvian Andes are available from a floristic survey conducted in six hectares of SDTF in Tumbes (LINARES-PALOMINO, unpubl. data) and from a SDTF site at 800 m altitude along the highway from Olmos towards the Porcuya gap on the Pacific side of the Western Massif, only 30 km from the Marañon basin, where the authors made collections on route to their study sites. There are two species in common (*Eriotheca ruizii* – a broad regional endemic, and *Geoffrea spinosa* – a Pleistocene Arc species) between the Tumbes and Bagua Grande plots, and one species (*Alseis peruvianum*) between the Tumbes and Tarapoto plots. If the floristic comparison is extended to compare these Tumbes

plots with species recorded outside of the present study plots through general collecting, a further four species (*Cordia lutea*, *Loxopterigium huasango*, *Bougainvillea peruvianum* and *Acacia macracantha*) are also found in common between the Tumbes plot and the general dry forest area of the Marañon basin bringing the total to four. Of these, *L. huasango* is endemic to SDTF areas of the north of Peru. This species was found for the first time in the Marañon drainage, east of the Andes during this study (J. MITCHELL, pers. comm.), but its distribution in the Marañon basin (i.e. eastern side) appears to be confined to the immediate slopes of the Massif, and is not present further eastwards into the Department of Cajamarca. This indicates lower similarity (ca. 2.5%) between the Marañon area and Pacific sites than demonstrated for the comparison with Coto de Caza Angolo. Limited collections made by the authors on the Olmos highway contain three species in common with those of the Marañon basin – *Celtis loxensis*, *Ruprechtia aperta* and *Loxopterigium huasango* (all regional endemics).

A wider biogeographic question concerns the affinities of the northern Peruvian SDTF with SDTF in Ecuador and Bolivia, adjacent to Peru. El Bosque Petrificado de Puyango is found in the south of Ecuador in the provinces of Loja and El Oro. A survey of 0.2 hectares of this SDTF identified 49 species with a dbh ≥5cm (KLITGAARD & al., 1999). A floristic comparison between this plot and those at Bagua Grande and Tarapoto reveal little similarity – with only one species in common with the Bagua Grande plot (*Eriotheca ruizii*), and none with the Tarapoto plot. However, a more in depth enquiry focusing on the Leguminosae shows clear floristic links between the STDFs of northwestern Peru and southern Ecuador. *Leguminosae* are a good indicator group in this case because it was more thoroughly collected than other families; one of the authors (Toby Pennington) is a legume specialist and his collecting in the Marañon and Tarapoto areas focused solely upon this family. Furthermore, there is a recent checklist for legumes from Southern Ecuador (LEWIS & KLITGAARD, 2002) record 247 native legume species and 24 introduced legume species for southern Ecuador. Of the 44 legume species recorded in the present survey, 21 have also been recorded for southern Ecuador. In addition the SDTFs of southern Ecuador and northwestern Peru share many of the same regional endemics e.g. *Pithecellobium excelsum*, *Cyathostegia mathewsii*, *Celtis loxensis*, *Loxopterygium huasango* and *Eriotheca ruizii*.

A comparison of the SDTF species lists for both the Marañon valley and Tarapoto with the Catalogue of the Vascular Plants of Ecuador (JØRGENSEN & LEÓN-YÁNEZ, 1999) reveals that of the 92 woody species recorded to species level in the Marañon valley, 37 (40%) are also found in Ecuador. Many of the shared species are endemic to northern Peru and Southern Ecuador. Of the 72 woody species found in the SDTFs around Tarapoto, 21 (29%) are found in Ecuador, although the majority of these are widespread, ecologically general species. Unlike the Marañon valley, there are no shared endemics between Tarapoto and southern Ecuador.

KESSLER & HELME (1999) present a floristic survey of the SDTF of the Central Tuichi Valley in Bolivia. General collections made by the authors combined with species lists compiled for the area by others reveal 147 species of tree. Of these, 75 are identified to species level allowing comparisons to be made with our floristic lists. Five species are found to be in common with the present study plots – *Hura crepitans*, *Casearia sylvestris*, *Albizia niopoides*, *Trichilia elegans* and *T. pleeana*, representing a similarity of ca. 3% with the Tarapoto plot, and ca. 1% with the Bagua Grande plot. All of these species are widespread ecological generalists and not confined to SDTFs. From the study of selected indicator groups (*Acanthaceae*, *Araceae*, *Bromeliaceae*, *Cactaceae*, *Palmae* and *Pteridophyta*), KESSLER & HELME estimate that 24% of the flora of the Tuichi Valley to be endemic to Bolivia, with 3% endemic to the valley itself. They record the strongest phytogeographical affinities to be with other lowland SDTF areas within Bolivia, as well as similar forests along the sub-Andean zone to northwestern Argentina and extending to interior southeastern Brazil. They conclude that there are few affinities with the SDTFs of northern S. America, and our data certainly supports this. Strongest floristic links appear to lie between the SDTFs of the Marañon basin and southern Ecuador which we suggest may make up a phytogeographic unit, whilst the affinities of the Tarapoto SDTFs lie elsewhere.

In summary, a comparison of the two present SDTF plots with those of other nearby but disjunct SDTF in Peru (Tumbes), Bolivia (Central Tuichi Valley) and Ecuador (Bosque Petrificado de Puyango), clearly shows that the floristic links between the dry forest patches in Peru and Bolivia, and within Peru itself are relatively weak, with strong internal heterogeneity. At the generic level, SARMIENTO (1975) has analysed the floristic affinities of the dry vegetation formations (in the broadest sense) of South America. He recorded the maximum Sorensen coefficient of similarity of the Central Andean valleys (including the Marañon and Huallaga) as 48% (ca. 34 genera in common), its closest floristically being the Northern Andean valleys of Venezulea and Ecuador. However, the SDTFs of the Central Andes were omitted from the analysis. Certainly there are generic-level similarities between all of the dry forest formations, but in the case of the northern Peruvian Inter-andean SDTFs, few at the species level.

Conclusions

Data derived from SDTF inventory plots and from general collecting indicates that although the woody flora of the northern Peruvian SDTFs is depauperate, it comprises a high percentage of narrow regional endemic species. Disjunct SDTF patches on the Pacific coast, in the Marañon valley and around Tarapoto show remarkably little floristic similarity for the woody flora, suggesting that there has been little recent historical species movement between them. This has important implications for the establishment of conservation areas because protection of each SDTF fragment will be necessary if all species are to be protected. The obvious present-day physical barriers preventing species migration between the SDTF areas are the Eastern and Western Andean Massifs and the mesic montane forest which clothes them. However, the SDTF areas might have been joined in the past before the uplift of the Andes, with the low similarity reflecting subsequent speciation and extinction. An examination of the species distribution patterns suggests that some species migration between the Marañon drainage and the Pacific region may have occurred recently via the Porcuya Gap – the lowest pass over the Andes. Based on the comparison with SDTF plot data from southern Ecuador, there appears to be little floristic similarity between the northern Peruvian dry forests and this region. However, a more detailed analysis of Leguminosae suggests that these areas do belong to a putative phytogeographical unit. The low floristic similarity between the Peruvian (and Ecuadorean) and Bolivian dry forests would indicate that the latter may be more closely related to those of Argentina, Paraguay and Brazil and should not belong to the phytogeographical unit of the northern areas.

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Appendix 1. – Species list.
The species lists are arranged by family, region, and by Department. The species lists are composed from plot inventories together general collections made from around the plot areas. The majority are woody. Species which occurred in the plots are identifed by 'P'. Species occurring in gallery forest are identified by 'g'. Vouchers were collected by S. Bridgewater (S) & Toby Pennington (RTP).

Species	*A*	*B*		*C*
	Pacific Drainage (Cajamarca)	*Marañon Drainage*		*Tarapoto (San Martín)*
		Cajamarca	*Amazonas*	
Acanthaceae				
Justicia sp. (S972)			P	
Pachystachys puberula Wassh.				X
Tetramerium aff. *peruvianum* (Lindau) T. F. Daniel		X		
Anacardiaceae				
Astronium fraxinifolium Schott				X
Loxopterygium huasango Spruce	X		X	
Schinopsis peruviana Engl.				X
Annonaceae				
Rollinia cf. *mucosa* (Jacq.) Baill.				X
R. ulei Diels				X
Xylopia aromatica (Lam.) Mart.				X
Apocynaceae				
Aspidosperma cf. *parvifolium* A. DC.		X	P	
Geissospermum reticulatum A. H. Gentry			X	
Araceae				
Anthurium bardayanum Engl.				X
Asteraceae				
Baccharis tricuneata (L. f.) Pers.	X			
Onoseris weberbaueri Ferreyra			P	
Bignoniaceae				
Cybistax antisyphilitica (Mart.) Mart.				X
Jacaranda glabra (DC.) Bureau & K. Schum.				X
Tabebuia aurea (Manso) S. Moore				X
T. roseo-alba Ridley				X
Tabebuia sp. (S967)			P	
Tabebuia sp. (S2769)				X
Tabebuia sp. (S2727)			X	
Tecoma rosifolia Kunth			X	
Tecoma sp. (S1042)		X	X	
Bombacaceae				
Ceiba insignis (Kunth) Gibbs & Semir			P	
Eriotheca ruizii (K. Schum.) A. Robyns		X	P	
Pachira aff. *aquatica* Aubl.				X
Boraginaceae				
Cordia alliodora (R. & P.) Oken				x
C. iguaguana I. M. Johnst.			P	
C. lutea Lam.			X	
C. varronifolia I. M. Johnst.		X		
Cordia sp. (S2803)				P
Heliotropium cf. *arborescens* L.				X

Appendix 1 (cont.)

Species	*A*	*B*		*C*
	Pacific Drainage (Cajamarca)	*Marañon Drainage*		*Tarapoto (San Martín)*
		Cajamarca	*Amazonas*	
Boraginaceae (cont.)				
Heliotropium sp. (S2707)		X		
Saccelium lanceolatum Kunth		X	P	
Cactaceae				
Browningia altissima (F. Ritter) F. Buxb.		X		
Ceistocactus sp.		X		
Espostoa sp.		X		
Melocactus bellavistensis Rauh. & Backeb.		X		
Pereskia rorida DC.			X	
Praecereus euchlorus K. Schum.			P	
Rauhocereus riosaniensis Backeb.			P	
Cactaceae sp.			P	
Leguminosae: Caesalpinioideae				
Apuleia leiocarpa (Vog.) Macbride				X
Bauhinia glabra Jacq.			X	X
Bauhinia sp. (RTP785)		X		
Caesalpinia cassioides Willd.		X		
C. glabrata Kunth		X		
C. spinosa Kuntze			X	
Caesalpinia sp. nov. (RTP 955)		X		
Parkinsonia praecox (R. & P.) Hawkins			X	
Senna bacillaris (L. f.) Irwin & Barneby				X
S. huancabambae (Harms) Irwin & Barneby		X		
S. mollissima (Willd.) Irwin & Barneby	X		X	
S. pallida (Vahl) Irwin & Barneby		X	X	
S. pistaciifolia (Kunth) Irwin & Barneby	X			
Capparaceae				
Belencita sp. (S965)			P	
Capparis crotonoides Kunth				X
C. guayaquilensis Kunth		X	P	
C. cf. *heterophylla* DC.	X			
C. petiolaris Kunth			P	
C. quina J. F. Macbr.				X
C. scabrida Kunth		X	X	
Capparis sprucei Eichl.			P	X
Capparis sp. (S1052)	X			
Morisonia oblongifolia Britton				X
Steriphoma cinnabarina Gilg				X
Caricaceae				
Carica candicans A. Gray	X			
Celastraceae				
Maytenus durifolia Briq.	X			
M. macrocarpa (Ruiz & Pav.) Briq.				P
Maytenus cf. *octogna* (L'Hér.) DC.			X	
Maytenus sp. (S963)			P	
Maytenus sp. (S2730)			P	
Maytenus sp. (S2782)				P

Appendix 1 (cont.)

Species	*A*	*B*		*C*
	Pacific Drainage (Cajamarca)	*Marañon Drainage*		*Tarapoto (San Martín)*
		Cajamarca	*Amazonas*	
Clusiaceae				
Clusia sp. (S956)		X		
Clusia sp. (S2790)				P
Rheedia spruceana Engl.				X
Commelinaceae				
Commelinaceae (RTP 981)				X
Connaraceae				
Connarus elsae Forero				X
C. punctatus Planch.				X
Convolvulaceae				
Evolvulus cf. *magnus* Helwig			X	
Ipomoea carnea Jacq.		X		
Crassulaceae				
Crassulaceae sp. (S1047)		X		
Dilleniaceae				
Curatella americana L.				X
Ebenaceae				
Diospyros inconstans Jacq.				X
Elaeocarpaceae				
Sloanea sp. (RTP752)			P	
Erythroxylaceae				
Erythroxylum aff. *deciduum* A. St.-Hil.			P	
E. cf. *ulei* O. E. Schulz				P
Euphorbiaceae				
Croton sp. (S964)			P	
Croton sp. (S952)		X		
Croton sp. (S958)			P	
Croton sp. (S1002)			X	
Drypetes sp. (S2779)				X
Euphorbia sp.			P	
Hura crepitans L.			P	
Maprounea guinanesis Aubl.				X
Phyllanthus acuminatus Vahl		X		
Euphorbiaceae sp. (S998)			X	
Euphorbiaceae sp. (S958)			P	
Euphorbiaceae sp. (S995)			P	
Leguminosae: Faboideae				
Aeschynomene mollicula Kunth		X	X	
Clitoria amazonum Benth.				X
C. juninensis Fantz			X	
Coursetia maraniona Lavin		X		
Cyathostegia matthewsii (Jacq.) Benth.			P	
Dalea carthagenensis var. *brevis* (J. F. Macbr.) Barneby		X	X	
Desmodium cajanifolium (Kunth) DC.				X

Appendix 1 (cont.)

Species	*A*	*B*		*C*
	Pacific Drainage (Cajamarca)	*Marañon Drainage*		*Tarapoto (San Martín)*
		Cajamarca	*Amazonas*	
Leguminosae: Faboideae (cont.)				
D. cf. *incanum* DC.		X		
Erythrina velutina Willd.	X			
Geoffrea spinosa Jacq.		X	P	
Indigofera lespedezioides Kunth				X
I. suffruticosa Mill.		X		
Lecointea cf. *peruviana* J. F. Macbr.				X
Lonchocarpus atropurpureus Benth.		X		
L. confertiflorus Benth.				X
L. hedyosmus Miq.				X
Machaerium isadelphum (E. Meyer) Amshoff				X
Machaerium sp. (RTP 968)				X
Machaerium sp. (RTP 971)				X
Platymiscium gracile Benth.				X
P. pinnatum (Jacq.) Dugand			P	X
Pterocarpus sp. (RTP 983)				X
Stylosanthes sympodialis Taub.		X		
Tephrosia cinerea (L.) Pers.		X		
Flacourtiaceae				
Adenaria floribunda Kunth				X
A. cf. *tumbezensis* J. F. Macbr.		X	X	
Casearia sylvestris Sw.				P
Xylosma sp. (S2755)				X
Flacourtiaceae sp. (S2712)		X		
Gesneriaceae				
Gesneriaceae (S1016)			X	
Hippocrateaceae				
Salacia sp. (RTP752)			P	
Krameriaceae				
Krameria lappacea (Dombey) Burdet & B. B. Simpson		X		
Juglandaceae				
Juglans neotropica Diels			X	
Lythraceae				
Physocalymma scaberrimum Pohl				X
Malphigiaceae				
Bunchosia hookeriana A. Juss.				X
Byrsonima crassifolia (L.) Kunth				X
Stigmaphyllon peruvianum Nied.		X		
Malphigiaceae (S1036)		X		
Malphigiaceae (RTP803)		X		
Malphigiaceae (S2714)		X		
Malvaceae				
Hibiscus brasiliensis L.			X	
Hibiscus sp. (S993)			P	
Pavonia cf. *mollis* Kunth			X	
Tetrasida polyantha Ulbr.			X	

Appendix 1 (cont.)

Species	*A*	*B*		*C*
	Pacific Drainage (Cajamarca)	*Marañon Drainage*		*Tarapoto (San Martín)*
		Cajamarca	*Amazonas*	
Melastomataceae				
Tibouchina ochypetala (Ruiz & Pav.) Baill.				X
Meliaceae				
Cedrela sp. nov. (RTP 1031)	X			
Cedrela sp. (RTP 786)			Xg	
Schmardea microphylla Müll.	X			
Trichilia elegans A. Juss.				X
T. pallida Sw.			X	
T. pleeana (A. Juss.) C. DC.				X
T. tomentosa Kunth	X			
T. ulei C. DC.			X	
Leguminosae: Mimosoideae				
Acacia aroma Hook. & Arn.		X		
A. farnesiana (L.) Willd.				X
A. macracantha Willd.			X	
A. polyphylla DC.			P	
A. tortuosa (L.) Willd.			P	
A. weberbaueri Harms		X		
Albizia niopoides (Benth.) Burkart			X	
Albizia sp. nov. (aff. *niopoides*)				X
Calliandra mollissima (Willd.) Benth.			X	
Chloroleucon mangense (Jacq.) Britton & Rose		X		X
Cojoba aff. *chazutensis* Standl.			X	
Inga ornata Kunth			X	
I. tenuicalyx T. D. Penn.				X
Leucaena trichodes (Jacq.) Benth.		X	P	
Mimosa pectinatipinna Burkart		X	X	
Piptadenia viridiflora (Kunth) Benth.			P	
Piptadenia sp. (P16838)				X
Pithecellobium excelsum (Kunth) Benth.			P	
Pithecellobium sp. (RTP 945)		X		
Prosopis aff. *juliflora* (Sw.) DC.		X		
Moraceae				
Clarisia racemosa Ruiz & Pav.				X
Ficus trigona L. f.			Xg	
Maclura tinctoria (L.) Steud.		Xg		
Sorocea sp. (S2799)				P
Myrtaceae				
Myrtaceae (S1005)			X	
Myrtaceae (S2820)	X			
Myrtaceae sp (S2791)				X
Nyctaginaceae				
Bougainvillea peruviana Humb. & Bonpl.			X	
B. pachphylla Standl.		X		
Bougainvillea sp. (S991)			P	
Bougainvillea sp. (S950)		X		
Neea cf. *spruceana* Heimerl				X
Nyctaginaceae			P	
Nyctaginaceae (RTP747)			P	

Appendix 1 (cont.)

Species	*A*	*B*		*C*
	Pacific Drainage (Cajamarca)	*Marañon Drainage*		*Tarapoto (San Martín)*
		Cajamarca	*Amazonas*	
Ochnaceae				
Ouratea sp. (S2805)				P
Piperaceae				
Peperomia sp. (S974)			P	
Piper sp. (RTP787)			X	
Phytolacaceae				
Phytolacca weberbaueri H. Walter	X			
Rivinia humilis L.			P	
Polygonaceae				
Coccoloba scandens Casar.				P
C. sphaerococca Lindau				P
Ruprechtia aperta Pendry			P	X
Triplaris peruviana C. A. Mey.				X
T. weigeltiona (Rchb.) Kuntze			Xg	
Portulacaceae				
Talinum triangulare (Jacq.) Willd.		X		
Rhamnaceae				
Colubrina cf. *retusa* (Pittier) R. S. Cowan			P	X
Rhamnus sp. (S2752)				X
Rubiaceae				
Alseis peruvianum Standl.				X
Condaminea corymbosa (Ruiz & Pav.) DC.				X
Randia armata (Sw.) DC.				X
Randia sp. (S2785)				P
Simira *cf.* rubescens *(Benth.) Steyerm.*				P
Rutaceae				
Amyris pinnata Kunth				X
Zanthoxylum culantrillo Kunth			P	
Z. rigidum Willd.			P	
Z. juniperinum Poepp.		X		
Zanthoxylum sp. (RTP748)			P	
Sapindaceae				
Allophylus floribundus (Poepp.) Radl.				X
A. loretensis Mart.				P
Sapindus saponaria L.			X	
Sapotaceae				
Manilkara bidentata (A. DC.) Chev.			Xg	X
Sideroxylon obtusifolium (Roem. & Schult.) T. D. Penn.		X	P	
Solanaceae				
Cestrum auriculatum L'Hér.				X
C. racemosum Ruiz & Pav.	X			
Solanum sp. (S1025)		X		

Appendix 1 (cont.)

Species	*A*	*B*		*C*
	Pacific Drainage (Cajamarca)	*Marañon Drainage*		*Tarapoto (San Martín)*
		Cajamarca	*Amazonas*	
Theophrastaceae				
Clavija myrmeciocarpa Stahl			X g	
Clavija sp. (S2721)			P	
Jacquinia pubescens Kunth		X		
Tiliaceae				
Apeiba tiboubou Aubl.				X
Luehea paniculata Mart.				X
Ulmaceae				
Celtis aff. *pubescens* Humb. & Bonpl.				P
C. loxensis C. C. Berg			P	
C. affinis De Wild.	X			
Guazuma ulmifolia Lam.			P	
Urticaceae				
Boehmeria sp. (S1027)			X	
Pilea sp. (S1006)			X	
Urera elata (Sw.) Griseb.				P
Verbenaceae				
Aloysia virgata (Ruiz & Pav.) Juss.				X
Duranta sp.			P	
Duranta sp. (S2819)	X			
Vochysiaceae				
Vochysia haenkeana Mart.				X
Unknown family				
Unknown (S964)			P	
Unknown (S2767)				X
Unknown (S2757)			X	
Unknown (S966)			P	

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VEGETATION CLASSIFICATION AND FLORISTICS OF THE SAVANNAS AND ASSOCIATED WETLANDS OF THE RIO BRAVO CONSERVATION AND MANAGEMENT AREA, BELIZE

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A floristic inventory and preliminary vegetation classification were made for the tracts of savanna and associated wetland vegetation in the Rio Bravo Conservation and Management Area (RBCMA) in Belize. A total of 258 species were recorded, representing c.7% of the Belizean flora. Of these, 148 species are characteristic of the drier savanna systems, while 47 show a preference for hydrologic savanna and wetland areas. Only 57 species (22% of RBCMA savanna flora) are woody, with the savanna tree flora comprising 15 species. The flora of the RBCMA was found to be fairly typical of the savannas of the Central American and Caribbean region. Savanna systems are generally poorly represented in conservation areas in Central America, and due to the diverse range of structural and ecological formations of this vegetation type found within the RBCMA, and its relatively diverse flora, this reserve constitutes an important protected area.

Keywords. Belize, floristics, phytogeography, savanna, wetlands.

INTRODUCTION

Neotropical savanna covers over 2 million km^2, and represents the second largest vegetation formation in the American tropics (Mistry, 2000). Several studies have assessed the phytogeographic affinities of this widely distributed vegetation type (e.g. Sarmiento, 1983; Lenthal *et al.*, 1999), although a lack of detailed floristic information for many savanna systems prevents the undertaking of rigorous, analytical studies. The savannas of Belize represent the most northerly distribution of the Central American savannas. They lie on the margin of lowland humid tropical formations and as such are of phytogeographic and ecological importance. At present there is only a poor account of the Belizean savanna flora, and there is a need for detailed floristic inventories to assist local and regional conservation planning.

In Central America and on the Caribbean islands, major savanna areas occur in southern Mexico, Belize, Honduras, Nicaragua, southwest Panama and central and eastern Cuba (Huber, 1987). These widespread savannas are ecologically varied; the lowland savannas tend to be hyperseasonal in nature (*sensu* Sarmiento, 1983), i.e.

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with flooding and drought conditions occurring during each annual cycle, while the upland savannas are usually better drained, with reduced ground water effects.

The study reported here focused on the hydrologic and well-drained savannas found in two areas in Belize, both lying within the Rio Bravo Conservation and Management Area (RBCMA) managed by the NGO (non-governmental organization) *Programme for Belize* (PfB) (Fig. 1). It seeks to refine the savanna and wetland vegetation classifications of Brokaw *et al.* (1990) for the RBCMA, and to provide comprehensive species lists for the savanna and related wetland flora for use in environmental planning.

The vegetation of Belize was first mapped in detail by the Land Use Survey Team (Wright *et al.*, 1959), and their classification of savanna and related vegetation (including pine forest) attributed c.262,467 hectares to these communities. This constitutes approximately 12% of the surface area of Belize, which covers a total of 22,963km^2. The report classified Belizean savannas and associated forest-type communities into seven broad categories. These include pine and oak forests, orchard and open grass communities, and areas of savanna with scattered pine. Wright attributes a further 62,157 hectares (2.8% of land area) to herbaceous marshes dominated by rush and sedge vegetation. A more recent study, by Rejmánková *et al.* (1996), characterized all Belizean wetland vegetation types into three basic types defined by species of *Eleocharis*, *Cladium* and *Typha.*

A later study, by King *et al.* (1992), groups all Belizean savannas and pine forests into one group – pine forest and orchard savanna. The stage at which 'pine savanna' ('savanna with scattered pines' or its denser form 'pine ridge'[1]) can be differentiated from 'pine forest' is a moot point, as the species composition of the two can be extremely similar and there is a continuous range of physiognomy uniting them. Most authors agree, therefore, that they should be classified together.

Brokaw *et al.* (1990) conducted the first detailed study of the vegetation of the RBCMA, distinguishing upland forest, cohune ridge and palm forest, swamp forest, marsh, pine ridge and savanna. This study estimated that 2.8% of the RBCMA area was covered by savanna. This includes pine ridge (pine woodland) which occurs mainly on the sandy soils in the northeast of the area. The vegetation descriptions resulting from this preliminary vegetation classification are valuable, but do not give any detailed floristic information on the savannas, nor do they make any floristic comparisons with other savanna areas. Owing to the reconnaissance nature of this initial study, the herbaceous component was also ignored. Iremonger & Brokaw (1995) devised a vegetation classification for Belize, and in this a number of savannas and wetland vegetation types were identified, with general pine savanna classified as 'lowland needle-leaf moist open forests over poor soils'. They also identify three

[1] In Belize, the local term 'ridge', when used to describe vegetation, e.g. pine ridge, cohune ridge, etc., can be confusing. It is used to describe a strip of vegetation and does not imply a change in topography. Where the term 'broken ridge' is used, this refers to an uneven canopy. In the case of pine ridge (often found scattered in open savanna) it implies a savanna-type vegetation with a reasonably dense occurrence of pine.

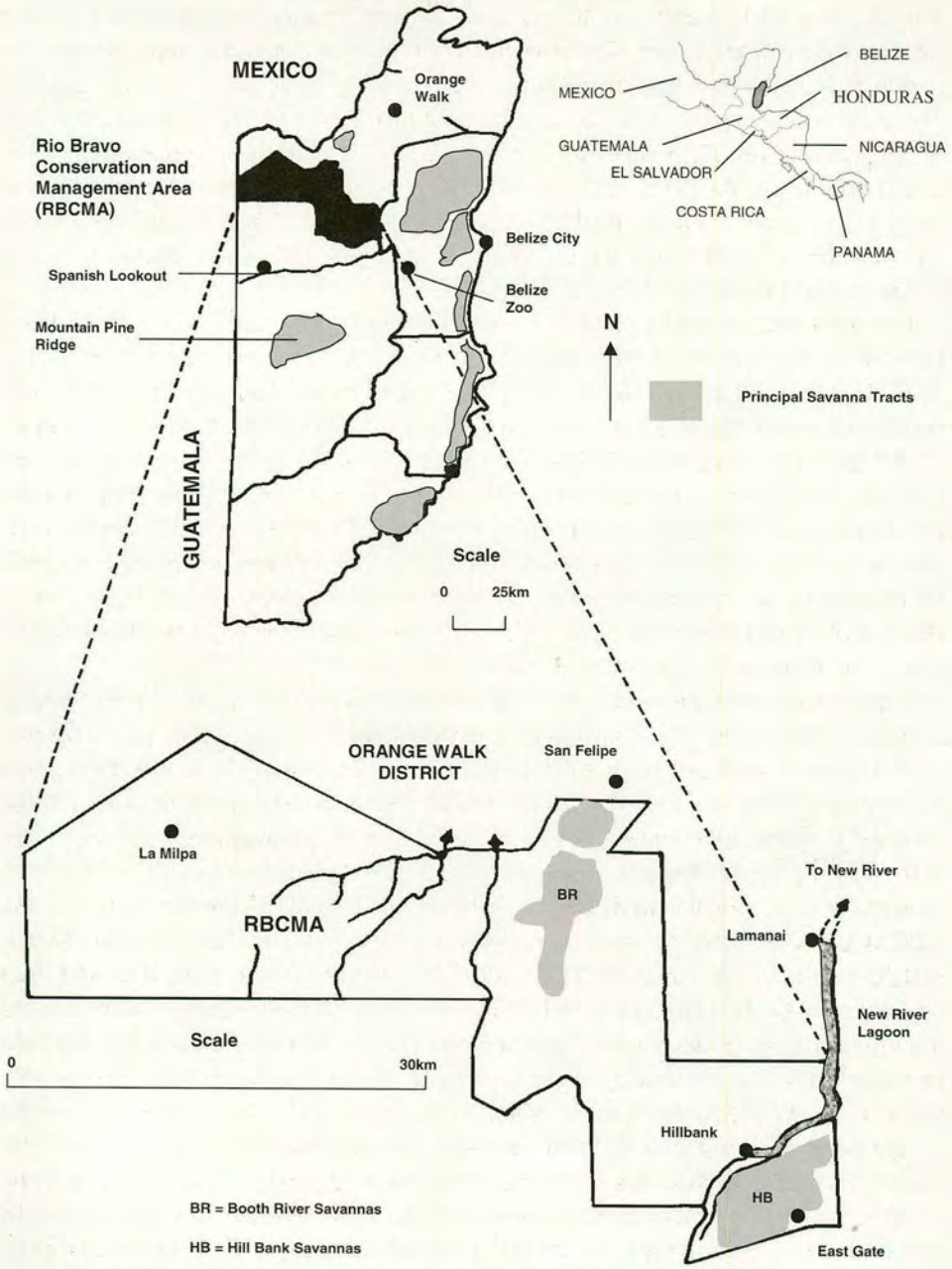

FIG. 1. Map of main savanna tracts within Belize, and savanna distribution within the RBCMA.

types of non-saline seasonally waterlogged scrubs, three types of non-saline scrub which are not influenced by high water tables, and four non-saline herbaceous communities, including freshwater wetlands.

Site Description and Methods

The RBCMA is situated in Orange Walk district, northwest Belize, and is considered geologically part of the Yucatán Peninsula. It covers an area of 82,000 hectares and is almost entirely covered with natural forest, savanna and marsh (Brokaw *et al.*, 1990). Figure 1 shows the distribution of savanna within the RBCMA, as well as the principal savanna and pine forest areas within Belize. The climate is subtropical, with only minor seasonal variations in temperature and a distinct dry season. Annual daytime temperatures vary between 26°C and 32°C, with the highest temperatures occurring in April and May, towards the end of the dry season. Total annual rainfall averages about 1500mm, with a marked dry season between February and May (Wright *et al.*, 1959). Following Koeppen's classification the climate is tropical wet-dry. The RBCMA occurs on a geological formation known as the Yucatán Platform. This consists of a limestone plain covering the northern half of Belize with geology and vegetation continuous with the southern half of the Yucatán of Mexico and the northern Petén of Guatemala (Standley & Record, 1936).

The savanna and wetland vegetation surveys were focused on the areas lying between East Gate and Hill Bank, and those around Booth River (Fig. 1). The study areas were initially identified through remotely sensed images using a 1993 Landsat TM image covering the full extent of the RBCMA, with additional information coming from aerial photography and a SPOT panchromatic image (Furley *et al.*, 2001). Areas identified as being savanna, wetland or savanna/forest transition communities were subsequently ground-truthed by wide-patrolling, general observation and collecting. The surveys loosely followed a series of transects cutting across the savanna area. Quantitative data were collected for 80 trees (20 points) for one area of dense savanna pine ridge close to East Gate using the point-centre quarter technique (Mueller-Dombois & Ellenberg, 1974). Field work was conducted in three phases: a two-month period from mid-July to mid-September 1996, a two-week period in March 2000, and a four-day period during March 2001.

Broad descriptions were made for all vegetation types encountered and an attempt was made to classify the vegetation subtypes following Brokaw & Mallory (1993). Where this was not possible new classifications were devised using terminology that complemented those already used locally. The dominant defining species and general physiognomy of all subtypes were noted. Duplicate collections were made of all higher plants found in the area and are currently held at the Royal Botanic Garden Edinburgh (E) and the Forestry Department, Ministry of Natural Resources, Belmopan, Belize (BRH).

Results

A total of 400 collections were made, representing 258 species. A full species list by family is given in Appendix 1, together with notes on growth forms. Appendix 2 provides species lists by habitat. Table 1 presents the phytosociological parameters for those tree species recorded in an area of broken pine ridge (pine woodland), and Table 2 lists the primary savanna and wetland vegetation subtypes found within the RBCMA. The text below gives general descriptions of the savanna and associated vegetation types encountered within the RBCMA.

Savanna and wetland vegetation classification

The vegetation encountered during the field surveys has been broadly grouped into three main categories: savanna, wetland and savanna/forest transition, according to overall physiognomy, water regime and species composition. Within each of the wetland and savanna categories a number of subtypes have been identified. The subtypes give an idea of the range and variety of savanna vegetation and provide a useful terminology, but most form part of an ecological succession, part of an ecotone or reflect anthropomorphic modifications. As such they should not necessarily be considered as stable communities.

Table 1. Phytosociological parameters for the RBCMA broken pine ridge: absolute density (AD), relative density (RD), absolute dominance (ADo), relative dominance (RDo), absolute frequency (AF), relative frequency (RF), and importance value index (IVI) = RD + RDo + RF

	No. of individuals	Density/ hectare		Dominance/ hectare		Frequency/ hectare		
		AD	RD	ADo	RDo	AF	RF	IVI
Pinus caribaea	66	76.7	82.5	7.49	92.06	100	66.67	241
Quercus oleoides	10	11.6	12.5	0.57	7.06	30	20.0	40
Curatella americana	4	4.6	5.0	0.07	0.88	20	13.33	19

No. of individuals per hectare = 93. Average height = 21m.

Table 2. Savanna and wetland vegetation classification for the RBCMA

1 Savanna	2 Wetland
1.1 Grassland and scrub grassland	2.1 Fringing riverine red mangrove
1.2 Pine–palmetto savanna	2.2 Cutting grass marsh
1.3 Palmetto thicket	2.3 Marl flat
1.4 Savanna orchard	2.4 Sedge marshland
1.5 Woodland and pine ridge	2.5 Eleocharis–calabash marsh
1.6 Oak thicket	

Although isolated forest patches occur on better soils within the savanna region and narrow fringes of gallery forest can be found crossing it in association with watercourses, these were not surveyed, and Brokaw & Mallory's forest classification (1993) should be consulted. The transition zone from savanna to forest is often marked by the presence of oak thickets. Ecological descriptions and species lists have been compiled for these.

1 Savanna

Following Wright *et al.* (1959), the term savanna is used here in the broadest sense, and includes grasslands, dense woody thickets, orchards, woodlands and broken pine ridge. Where there is a conspicuous woody component of the vegetation, the defining species are *Pinus caribaea* Morelet (pine), *Quercus oleoides* Schltdl. & Cham. (oak), *Acoelorraphe wrightii* H. Wendl. ex Becc. (palmetto) and in more hydrologic transition areas to wetlands, *Crescentia cujete* L. (calabash). These three species occur in varying proportions but their conspicuous presence usually indicates this broad vegetation type. Common associates (usually occurring as woody shrubs or small trees) are *Byrsonima crassifolia* (L.) Kunth, *Curatella americana* L., *Chrysobalanus icaco* L., *Bucida buceras* L., *Semialarium mexicanum* (Miers) A.M.W. Mennega, *Eugenia winzerlingii* Standl., *Morinda royoc* L., *Cameraria latifolia* L. and *Gliricidia sepium* Kunth. *Miconia albicans* (Swartz) Triana and *Clidemia sericea* D. Don. also form very conspicuous components of the vegetation, especially in denser thicket transition areas into forest. *Haematoxylon campechianum* L. and *Dalbergia glabra* (Mill.) Standl. are associates of wetter areas. The ground layer of more open areas is dominated by a more or less continuous cover of grasses, although there is a rich associated herbaceous flora, of which *Ageratum radicans* B.L. Rob., *Diodia teres* Walter, *Agalinis hispidula* (Mart.) D'Aray, *Xyris ambigua* Beyr. ex Kunth, *Sauvagesia erecta* L., *Turnera diffusa* Willd., *Polygala variabilis* Kunth and *Melochia spicata* (L.) Fryxell are among the most common species. The orange-coloured parasite *Cassytha filiformis* L. is frequently seen trailing over the lower vegetation. The small cycad *Zamia loddigesii* Miq., although not abundant, is a characteristic plant of the savanna.

Within the broad definition of savanna, a number of savanna vegetation subtypes can be identified. These occur as a mosaic across the area. Although each subtype varies in its exact structure and species composition, they can usually be easily recognized.

2 Wetland

Wetlands are defined here as permanently or seasonally inundated open areas, usually characterized by the dominance of *Cyperaceae* (sedges) in the herbaceous layer, rather than *Gramineae* (grasses). The water table is very close to the surface and standing water creating anaerobic waterlogged conditions is frequently present during the wet season. Trees and shrubs are generally absent, or if present are species

characteristic of wetter areas such as *Dalbergia glabra*, *Bucida buceras*, *Crescentia cujete*, *Mimosa asperata* L. and occasionally *Rhizophora mangle* L. with its distinctive stilt roots.

A number of wetland subtypes exist which support a diverse wetland flora. Some of the most distinctive plants include *Phyla nodiflora* Greene, *Phyla stoechadifolia* (L.) Kunth, *Sagittaria lancifolia* L., *Hymenocallis littoralis* (Jacq.) Salisb., *Ludwigia octovalvis* (Jacq.) Raven, *Centella asiatica* (L.) Urban, *Passiflora foetida* L. and *Nymphaea ampla* (Salisb.) DC., as well as many species of sedge.

Detailed Vegetation Descriptions including Subtypes

1 Savanna

1.1 Grassland and scrub grassland

This subtype is characterized by the complete absence of trees, the only woody vegetation being occasional dwarf shrubs of *Byrsonima crassifolia*, *Semialarium mexicanum*, *Crescentia cujete*, *Curatella americana*, *Calliandra houstoniana* (Mill.) Standl., *Coccoloba* cf. *reflexifolia* Standl., *Zamia loddigesii*, *Eugenia winzerlingii* and *Gliricidia sepium*. *Randia* spp. and *Myrica cerifera* L. occur in transitional wetter areas. There is an almost complete ground cover of grasses and sedges and a rich herbaceous flora, the most conspicuous species being *Ageratum radicans*, *Diodia teres*, *Agalinis hispidula*, *Sauvagesia erecta*, *Xyris ambigua* Beyr. ex Kunth, *Turnera diffusa*, *Polygala variabilis*, *Melochia spicata* (L.) Fryxell, *Oxalis frutescens* L., *Spermacoce verticillata* L., *Drosera capillaris* Poir, *Hyptis conferta* Pohl ex Benth. and *Lycopodiella caroliniana* (L.) Pic. Serm. The herbaceous vegetation is frequently covered by the dodder *Cassytha filiformis*. This vegetation type is probably transitional in nature, and is related to frequent occurrences of fire. The majority of the shrub species can attain sizeable tree stature and in the absence of fire could be expected to reach significant heights. However, edaphic determinants – the presence of infertile sandy soils and the seasonally high water table – may also be responsible for checking woody growth.

1.2 Pine–palmetto savanna

A very open vegetation, often on sandy soils, in which the ground layer is dominated by tussock-forming grasses, with occasional scattered pines to 20m (although the majority are smaller). With the exception of *Pinus caribaea*, few other woody species reach tree stature and are usually present as shrubs, although *Crescentia cujete*, *Byrsonima crassifolia*, *Curatella americana*, *Cameraria latifolia* L. and *Quercus oleoides* can reach 10m, with *Quercus oleoides* and *Byrsonima crassifolia* even reaching 15m at forest margins. *Eugenia winzerlingii*, *Semialarium mexicanum*, *Pithecellobium insigne* Micheli, *Roupala montana* Aubl. and *Clidemia sericea* are other common woody associates, usually found as shrubs or saplings. Many of the areas have the appearance of having been burnt regularly and there is evidence of logging. The

burning might explain the dwarf nature of many of the woody species which would usually form larger shrubs or trees. The ground layer is made up of an almost continuous cover of tussock-forming grasses to 40cm; species of *Paspalum* are especially abundant. Pine–palmetto savanna has a rich herbaceous flora similar in composition to the savanna grasslands (1.1).

1.3 Palmetto thicket

This is a dense subtype often forming discrete clumps or corridors within the other savanna vegetation types, and is dominated by the palm *Acoelorraphe wrightii* with other trees almost entirely absent, except for very occasional oaks and pines. Palmetto thickets are associated with wetter, poorly drained areas, and range in height from 2 to 6m. Common woody associates of this vegetation type are *Byrsonima crassifolia*, *Crescentia cujete*, *Curatella americana*, *Calliandra houstoniana*, *Parathesis cubana* (A. DC.) Molinet & Maza, *Clidemia sericea*, *Eugenia winzerlingii* and *Gliricidia sepium*. The density of the ground flora varies from open to closed, and it is usually composed of tussock-forming grasses and sedges. *Blechnum serrulatum* L., *Lycopodiella caroliniana*, *Eleocharis* spp. and *Calea peckii* B.L. Rob. are among the most characteristic ground layer species.

1.4 Savanna orchard

This vegetation has the appearance of an 'orchard' with the trees evenly spaced, the majority rarely exceeding 8m, although some mature individuals of *Bucida buceras* are emergent and can attain 15m. It has a greater density of woody shrubs and small trees than other savanna subtypes, but its relatively open canopy and small stature easily distinguish savanna orchard from forest and pine ridge (savanna woodland). This vegetation type has been seen only in hydrologic transitional areas from wetland to more typical savanna. Savanna orchard is frequently seasonally waterlogged. The species composition of the savanna orchards varies greatly, but they tend to be dominated by *Bucida buceras*, *Haematoxylon campechianum* L. and *Cameraria latifolia*. *Crescentia cujete* is a common associate in wetter areas, sometimes even to the extent of dominating the vegetation (e.g. close to Booth River), others being *Malpighia glabra* L., *Jacquinia macrocarpa* Cav., *Coccoloba* sp., *Semialarium mexicanum*, *Byrsonima crassifolia*, *Chrysobalanus icaco* L., *Myrica cerifera* and occasional clumps *of Acoelorraphe wrightii*. *Pinus caribaea* and *Quercus oleoides* are conspicuously absent. The ground layer is open, dominated by grasses and sedges, with abundant *Cassytha filiformis*, and the herbaceous flora is more depauperate than in other drier savanna areas. The strong influence of water is often reflected in the ground flora, which can be dominated by a single species of sedge (*Eleocharis interstincta* R. Br.), with *Nymphoides humboldtianum* Kunth and *Mimosa asperata* sometimes present. The trees and shrubs can support an abundant epiphytic flora of *Tillandsia* sp., other bromeliads, orchids and parasitic mistletoes' *Phthirusa* spp.

1.5 Woodland and pine ridge

These tend to be *Pinus caribaea*-dominated areas (although oak is sometimes a conspicuous component), with the larger trees attaining 15m (and c.50cm dbh), forming a broken canopy. The woodland is conspicuously denser and has a far greater abundance of pine than pine–palmetto savanna, but is still considered a savanna subtype because of its typically savanna floristic composition. These denser pine areas usually show signs of burning, and cut stumps are common, evidence that these areas were managed or exploited in the past. *Quercus oleoides*, *Curatella americana* and occasionally *Guazuma ulmifolia* are associates which, together with sparse shrubby *Byrsonima crassifolia*, *Semialarium mexicanum*, *Calliandra houstoniana*, *Clidemia sericea*, *Chomelia protracta* (Bart. ex DC.) Standl. and clumps of *Acoelorraphe wrightii*, form an open understorey. The dry and very sandy soils support an open herbaceous layer. Together with the savanna generalists such as *Ageratum radicans* and *Sauvagesia erecta*, *Polypremum procumbens* L. and *Hypericum pratense* Cham. & Schltdl. are present. Occasionally the woody component is partially or completely dominated by oak (oak woodland), with only a few scattered pines.

1.6 Oak thicket

This is dense, sometimes impenetrable, thicket, the characteristic feature being dominance of the canopy by *Quercus oleoides* reaching 15m, and the occasional emergent pine. This type of vegetation appears to form over deeper drier soils, and is frequently associated with forest margins. Typical forest species such as *Sabal mauritiiformis* Griseb. & H. Wendl., *Guettarda combsii* Urban, *Cupania rufescens* Triana & Planch, *Bucida buceras*, *Hampea trilobata* Standl., *Chrysophyllum mexicanum* T.S. Brandegee, *Calophyllum brasiliense* Camb., *Metopium brownei* (Jacq.) Urb. and *Bursera simarouba* (L.) Sarg. can be found. Other common associates, which form a dense understorey, are: *Byrsonima crassifolia*, *Myrica* sp., *Curatella americana*, *Calliandra houstoniana*, *Chomelia protracta*, *Parathesis cubana*, *Clidemia sericea*, *Erythroxylum rotundifolium* Lunan, *Miconia albicans*, *Turnera aromatica* Arbo, *Helicteres mexicana* Kunth, *Coccoloba* cf. *barbadensis* Jacq. and *Randia* sp. Some areas show an abundance of tall palmetto to 5m. There is a dense ground herbaceous layer dominated by the usual savanna herbaceous flora previously described. These oak thickets have the greatest diversity of woody species amongst the savanna subtypes, due to the presence of elements from both the pine–palmettto savanna and forest floras.

2 Wetland

2.1 Fringing riverine red mangrove

This consists of very dense stands of red mangrove (*Rhizophora mangle*) to 5m fringing the rivers, with *Cladium jamaicense* Crantz also abundant. Associate species include *Pachira aquatica* Aubl., *Mimosa asperata*, *Metopium brownei*, *Heteropteris laurifolia* (L.) A. Juss., *Boehmeria cylindrica* (L.) Sw., *Wedelia acapulcensis* Kunth, *Typha dominguensis* Pers., *Acrostichum aureum* L., *Thelypteris* aff. *ovata* R.P. St.

John, *Sagittaria lancifolia*, *Centella asiatica*, *Nymphaea ampla*, *Salvinia minima* Baker, *Utricularia foliosa* L., *Bletia purpurea* (Lam.) DC., *Philodendron* sp., *Polygonum punctatum* Elliot, *Phyla nodiflora*, *Struthanthus orbicularis* (Kunth) Blume ex Schult., *Phthirusa pyrifolia* (Kunth) Eichler, *Mikania micrantha* Kunth, *Ipomea indica* Merrill and *I. sagittata.*

2.2 Cutting grass marsh

This is an almost monodominant marsh of *Cladium jamaicense* (cutting grass) to 2.5m, with occasional small trees of *Dalbergia glabra*, *Crescentia cujete*, *Bucida buceras* and *Rhizophora mangle*, rarely exceeding 5m. Common smaller associates are *Mimosa pudica*, *Heteropteris laurifolia*, *Hymenocallis littoralis*, *Acrostichum aureum*, *Mimosa asperata*, *Sagittaria lancifolia*, *Wedelia acapulcensis*, *Mitreola petiolata*, *Phyla nodiflora*, *P. stoechadifolia* (L.) Kunth and *Eleocharis interstincta.* It occurs as riverine fringing vegetation.

2.3 Marl flat

This is an open vegetation type with *Cyperaceae* (to 50cm) giving a sparse vegetation cover on a seasonally inundated white marl substrate. Associate species are *Eleocharis* sp., *Phyla nodiflora*, *Mimosa asperata*, *Dalbergia glabra*, *Rhizophora mangle*, *Bucida buceras*, *Heteropteris laurifolia*, *Cladium jamaicense*, *Mitreola petiolata*, *Bletia purpurea* and *Passiflora foetida.* Some areas have abundant seedlings of *Heteropteris laurifolia*, with *Centella asiatica* also common in places.

2.4 Sedge marshland

This consists of waterlogged areas dominated by *Cyperus* spp. to 1m, with occasional *Mimosa asperata* and *Sagittaria lancifolia.*

2.5 Eleocharis–calabash marsh

This is marshland where the ground layer is completely dominated by *Eleocharis interstincta.* The area is probably inundated for most of the year. Occasionally scattered trees of *Crescentia cujete* form a conspicuous component of this formation. Associate ground species include *Centella asiatica*, *Pluchea foetida* L. and *Sagittaria lancifolia.*

Discussion

The 258 species found in the pine savanna and related vegetation of the RBCMA reserve represent c.7.5% of the total flora of Belize (3408 species as recorded by Balick *et al.*, 2000). None of the 41 species recognized as endemic by Balick (1.2% of the flora) was recorded. Of those species observed during the present study, 148 have an apparent preference for drier savanna communities, with 44 preferentially found in the more humid wetland areas and 74 associated with forest margins. Brokaw *et al.* (1990) cite a total forest tree list of 167 species for the RBCMA. Of

the 'true' savanna species found during the present study, 57 (22%) are woody, of which 15 species (c.8% of the total savanna flora) can be classified as trees.

The characteristic savanna formations of RBCMA occur on soils of low fertility, mild acidity and coarse texture (Furley *et al.*, 2001). The distinctive palmetto associations have a strong tendency to increase in areas where the water table rises to the surface, their root systems being adapted to seasonal changes in water availability (Milne, 1997). Iremonger & Brokaw (1995) identify one of their forest vegetation types as 'palmetto/coco plum variant' forest, and to some extent the RBCMA palmetto thickets equate to these, although those found in this study can be considered only thickets as they are of limited stature and extent. The wetland communities occur in areas of seasonal or permanent inundation on soils with an increased amount of clay and silt. Vegetation types typical of the transition zone between the savanna and wetland habitats (e.g. savanna orchard) are heavily influenced by the height of the water table during the wet and dry seasons, with the savannas on the boundary of the wetlands often being hydrologic in nature.

The woody flora of the study site, although depauperate when compared with the rich tree savannas of the Brazilian cerrado biome (Ratter *et al.*, 1997), is fairly typical of the general savannas of the Central American and Caribbean region. In the Caribbean, the floristically most diverse savannas are found in Cuba, characterized by a high number of endemic palm species (Borhidi & Herrera, 1977). The dominant tree defining the RBCMA savannas is *Pinus caribaea* var. *hondurensis*, and this species occurs widely across the Central American region from Mexico to Honduras, in savanna, woodland and forest formations, up to an altitude of 600m. The other two classic widespread and abundant species found within RBCMA – *Byrsonima crassifolia* and *Curatella americana* – are the most widely distributed woody savanna species of the Neotropics. Both are identified as indicator species for Neotropical savannas and are considered to form a so-called 'basic floristic matrix' present in practically all Neotropical savanna lowlands (Huber, 1987). *Casearia sylvestris*, another species cited by Huber as belonging to this matrix, was not found in the RBCMA savannas, although it is present and common in Belize. Of the other woody savanna species recorded, most occur throughout Central America, and, as one might expect, the phytogeographic affinities of the RBCMA savannas lie very clearly with this region. A phytogeographic analysis of the floristic woody component of Neotropical savannas conducted by Lenthal *et al.* (1999) grouped together all the savannas of Central America and the Caribbean as a single phytogeographic province, with those from southern Mexico, the Petén and Belize not surprisingly most closely linked.

A comparison of the RBCMA savannas with other savanna areas within Belize reveals it to be floristically similar. The woody species list is nearly identical to those compiled by Furley & Ratter (1986) for savanna areas from Spanish Lookout and Belize Zoo (both to the south of the present study site in central Belize) and by Johnson & Chaffey (1973) for Mountain Pine Ridge (also in central Belize), the main exception being *Clethra occidentalis* which is recorded from the savannas and

pine forest of Mountain Pine Ridge, but is apparently absent from the RBCMA. *Clethra mexicana* and *Leucothoe mexicana* are also recorded as trees from the Mountain Pine Ridge savannas, with *C. mexicana* associated with savanna/gallery forest transition boundaries. Neither of these species was observed within the RBCMA. Another plant typical of the pine forests and savannas of Mountain Pine Ridge region and recognized as a Belizean endemic (Balick *et al.*, 2000) but noticeably absent from the RBCMA is *Schippia concolor.* The characteristic savanna orchard, dominated by *Crescentia cujete*, *Bucida buceras*, *Haematoxylon campechianum* and *Cameraria latifolia*, appears to be related to the 'jicaro savannas' described by Taylor (1963) from Nicaragua, which are characterized by *Crescentia alata* and *Haematoxylon brasiletto.* In Belize, *Haematoxylon campechianum* is noted by Balick *et al.* (2000) as being common in the Orange Walk and Corozal districts on periodically flooded limestone depressions. Savanna orchard appears to equate well with the 'bullet tree-logwood variant' forest of Iremonger & Brokaw (1995), although some of the species they identify as characteristic, such as *Calophyllum brasiliense* and *Manilkara zapota*, were not recorded in our studies.

The areas of broken 'pine ridge' are similar in structure to other larger tracts of pine forest areas within Belize. Johnson & Chaffey (1974) calculated a mean of 26 stems per hectare for pine forests at Sittee River and Deep River, for trees with a diameter greater than 15.2cm. A similar forest inventory of the Mountain Pine Ridge by the same authors (Johnson & Chaffey, 1973) recorded 61 stems per hectare for those over 15.2cm dbh. Although these surveys are not directly comparable to the phytosociological data of the present study, which recorded 93 stems per hectare for all trees with a dbh $\geqslant$10cm, the results suggest a fair degree of structural similarity. Fire is the predominant factor determining the density of pine stocking. It is clear that these savannas, as elsewhere in Central America, are a constantly changing mosaic of intergrading vegetation types representing stages on varying ecological continua, and as such none of the vegetation types can be considered as stable climaxes.

The factors maintaining pine savannas have been widely discussed (e.g. Standley & Record, 1936; Beard, 1953; Wright *et al.*, 1959; Taylor, 1963; Kellman & Meave, 1997; Negrón-Ortiz & Gorchov, 2000) and are beyond the scope of this study. Suffice it to say that current research suggests that in lowland tropical areas in the absence of fire, there may be a gradual replacement of pine savanna by broadleaf forest, even on nutrient-poor soils. This successional model has been proposed by Taylor (1963) for the pine savannas and broadleaf forests of Nicaragua where both are recorded as occurring on similarly nutrient-poor soils, with an observed invasion of broadleaf species into the savanna in the absence of fire. A similar invasion of pine forests by hardwood species has been noted in the Everglades National Park, where burning prescriptions were introduced to limit broadleaf invasion (Negrón-Ortiz & Gorchov, 2000). In a study on Mountain Pine Ridge, Kellman (1985) has shown that woody savanna plants can facilitate invasion by forest species through local addition of nutrients to the soil.

The present study shows that the savannas and wetlands of the RBCMA harbour a diverse flora, and are structurally varied, comprising both open and closed formations, with both well-drained and hydrologic formations represented. Considering the poor general conservation status of savanna systems, the RBCMA represents an important savanna conservation area.

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APPENDIX 1

List of all species recorded, and growth form classification

Growth form: (t) tree; (s) shrub; (wh) woody herb; (h) herb; (c) climber; (p) parasite; (e) epiphyte.

SPERMATOPHYTA

Acanthaceae
Aphelandra scabra R. Br. s
Odontonema callistachyum (Schltdl. & Cham.) Kuntze s

Alismataceae
Sagittaria lancifolia L. h

Amaryllidaceae
Hymenocallis littoralis (Jacq.) Salisb. h

Annonaceae
Annona glabra L. s
Malmea depressa (Baill.) R.E. Fr. t

Apocynaceae
Aspidosperma megalocarpon Müll. Arg t
Cameraria latifolia L. t
Rauwolfia trichophylla Baker s
Tabernaemontana alba Mill. t
Thevetia ahuai (L.) Rafin. s

Aquifoliaceae
Ilex guianensis (Aubl.) Kuntze s

Araceae
Philodendron sp. h
Syngonium angustatum Schott h

Asclepiadaceae
Cynanchum stenomeres (Gray) Standl. & Steyerm. c

Asteraceae
Ageratum radicans B.L. Rob. wh
Calea peckii B.L. Rob. wh
Emilia fosbergii Nicolson h
Melanthera nivea O.E. Schulz h
Mikania micrantha Kunth c
Pluchea foetida L. h
Wedelia acapulcensis Kunth wh
W. aff. *hispida* Kunth s

Bignoniaceae
Crescentia cujete L. t

Bombacaceae
Pachira aquatica Aubl. t
Pseudobombax ellipticum (Kunth) Dugand t

Boraginaceae
Cordia spinescens L. s
Heliotropium ternatum Vahl h

Bromeliaceae
Tillandsia balbisiana Schult.f. e

Burseraceae
Bursera simarouba (L.) Sarg. t
Protium copal (Cham. & Schltdl.) Engl. t

Campanulaceae
Lobelia cardinalis L. h

Celastraceae
Crossopetalum puberulum (Lundell) Lundell s
Semialarium mexicanum (Miers) A.M.W. Mennega s
(Syn.: *Hemiangium excelsium*; *Hippocratea excelsea*)

Chrysobalanaceae
Chrysobalanus icaco L. s
Hirtella americana L. s
H. racemosa Lam. s

Cochlospermaceae
Cochlospermum vitifolium (Willd.) Spreng. s

Combretaceae
Bucida buceras L. t

Connaraceae
Connarus lambertii Britton s

Convolvulaceae
Evolvulus sericeus Benth. c
Ipomea indica Merrill c
I. sagittata Lam. c
I. tuxtlensis House c

Cyperaceae
Bulbostylis cf. *barbata* C.B. Clarke h
B. cf. *juncoides* (Vahl) Kük. h

Pinaceae
Pinus caribaea Morelet t

Polygalaceae
P. variabilis Kunth h
Polygala sp. h

Polygonaceae
Coccoloba cf. *barbadensis* Jacq. t
C. cf. *reflexifolia* Standl. s/t
C. cozumelensis Hensl. s
Polygonum punctatum Elliot h

Portulacaceae
Portulaca pilosa L. wh

Proteaceae
Roupala montana Aubl. s/t

Rhizophoraceae
Cassipourea guianensis Aubl. t
Rhizophora mangle L. t

Rubiaceae
Alibertia edulis (L. Rich.) A. Rich. s
Amaioua corymbosa (Willd.) Kunth t
Chiococca alba (L.) Hitchc. s
Chomelia protracta (Bart. ex DC.) Standl. s
Coccocypselum guianense (Aubl.) K. Schum. h
Diodia teres Walter wh
Guettarda combsii Urban t
G. gaumeri Standl. s
Machaonia acuminata Kunth s
M. lindeniana Baill. s
Morinda royoc L. s
Palicourea triphylla DC. s
Psychotria frucitetorum Standl. s/t
P. officinalis Kuntze s
Randia aculeata L. s/t
R. lundellii Standl. s
Randia sp. s
Spermacoce verticillata L. h

Sapindaceae
Allophylus cominia (L.) Sw. s
Cupania rufescens Triana & Planch. t
Matayba oppositifolia (A. Rich) Britton t
Paullinia pinnata L. c
Serjania adiantoides Radlk. c
Serjania sp. c

Sapotaceae
Chrysophyllum mexicanum T.S. Brandegee t
Manilkara zapota (L.) Van Royen t
Sideroxylon obtusifolium (Roem. & Schult.) Penn. s

Scrophulariaceae
Agalinis harperi Pennell h
A. hispidula (Mart.) D'Aray h
Angelonia ciliaris Robins h
Bacopa monnieri (L.) Pennell h
Buchnera pusilla Kunth h
Russelia sarmentosa Jacq. h

Simaroubaceae
Simarouba glauca DC. t

Smilacaceae
Smilax spinosa Miller c

Sterculiaceae
Guazuma ulmifolia Lam. t
Helicteres mexicana Kunth s
Melochia spicata (L.) Fryxell wh
Waltheria indica L. wh

Ternstroemiaceae
Ternstroemia tepezapote Schltdl. & Cham. s

Theophrastaceae
Jacquinia macrocarpa Cav. t

Turneraceae
Piriqueta cistoides (L.) Griseb. h
Turnera aromatica Arbo wh
T. diffusa Willd. wh
T. ulmifolia L. wh

Typhaceae
Typha dominguensis Pers. h

Umbelliferae
Centella asiatica (L.) Urban h

Urticaceae
Boehmeria cylindrica (L.) Sw. h

Verbenaceae
Cornutia pyramidata L. s
Lantana camara L. s
Phyla nodiflora Greene h
P. stoechadifolia (L.) Small h
Stachytarpheta jamaicensis (L.) Vahl h
Vitex gaumeri Green t

Violaceae
Hybanthus calceolaria Schulze wh

Xyridaceae
Xyris jupicai L. Rich. h

Zamiaceae
Zamia loddigesii Miq. s

PTERIDOPHYTA

Blechnaceae
Blechnum serrulatum L. h

Pteridaceae
Acrostichum aureum L. h

Salviniaceae
Salvinia minima Baker h

Schizaeaceae
Lygodium venustum Sw. c

Thelypteridaceae
Thelypteris aff. *ovata* R.P. St. John h

LYCOPSIDA

Lycopodiaceae
Lycopodiella caroliniana (L.) Pic. Serm. h

Appendix 2

Species list arranged by habitat type

Savanna

Acacia collinsii Satford
Acoelorraphe wrightii H. Wendl. ex Becc.
Agalinis harperi Pennell
A. hispidula (Mart.) D'Aray
Ageratum radicans B.L. Rob.
Allophylus cominia (L.) Sw.
Andropogon bicornis L.
A. virginians L.
Angelonia ciliaris Robins
Aphelandra scabra R. Br.
Bauhinia divaricata L.
B. ungulata L.
Blechnum serrulatum L.
Buchnera pusilla Kunth
Bulbostylis cf. *barbata* C.B. Clarke
B. cf. *juncoides* (Vahl) Kük.
Byrsonima crassifolia (L.) Kunth
Calea peckii B.L. Rob.
Calliandra houstoniana (Mill.) Standl.
Cameraria latifolia L.
Caperonia castaneaefolia (L.) A. St.-Hil.
Casearia corymbosa Kunth
Cassytha filiformis L.
Centrosema angustifolium (Kunth) Benth.
Chamaecrista flexuosa (L.) Greene
C. hispidula (Vahl.) H.S. Irwin & R.C. Barneby
Chrysobalanus icaco L.
Cipura paludosa Aubl.
Cissampelos pareira L.
Clidemia novemnervia Triana
C. sericea D. Don
Clitoria guianensis (Aubl.) Benth.
Coccoloba cf. *reflexifolia* Standl.
Cochlospermum vitifolium (Willd.) Spreng.
Cordia spinescens L.
Cornutia pyramidata L.
Coutoubea spicata Aubl.
Crescentia cujete L.
Crotalaria sagittalis L.
Croton hirtus L'Herit.
Curatella americana L.
Cynanchum stenomeres Standl. & Steyerm.
Dalechampia schippii Standl.
Desmodium barbatum (L.) Benth. & Oerst.
D. canum (J.F. Gmel.) Schinz & Thellung
Dichanthelium cf. *acuminatum* (Sw.) F.W. Goul & C.A. Clark
D. strigosum (Muhl.) Freckmann
Digitaria cayoensis Swallen
Digitaria sp. (B94)
Diodia teres Walter
Drosera capillaris Poir.
Echinochloa colona (L.) Link
Emilia fosbergii Nicolson
Eragrostis elliotti S. Wats.
Erythroxylum rotundifolium Lunan
Eugenia cf. *axillaris* G. Don
E. origanoides O. Berg
E. winzerlingii Standl.
Evolvulus sericeus Benth.
Gliricidia sepium Kunth

Guettarda combsii Urban
Havardia albicans (Kunth) Britton & Rose
Heliotropium ternatum Vahl
Henriettea succosa (Aubl.) DC.
Heteropteris laurifolia (L.) A. Juss.
Hibiscus costatus A. Rich.
Hirtella racemosa Lam.
Homolepis aturensis (Kunth) Chase
Hybanthus calceolaria Schulze
Hyperbaena winzerlingii Standl.
Hypericum pratense Cham. & Schltdl.
Hyptis conferta Pohl ex Benth.
Ilex guianensis (Aubl.) O. Kuntze
Ipomea sagittata Lam.
Ischaemum latifolium (Spreng.) Kunth
Jacquinia macrocarpa Cav.
Lantana camara L.
Lechea torreyi Leggett. var. *congesta* Hodgson
Lobelia cardinalis L.
Lycopodiella caroliniana (L.) Pic. Serm.
Lygodium venustum Sw.
Maranta arundinacea L.
Marsypianthes chamaedrys (Vahl) Kuntze
Melanthera nivea O.E. Schulz
Melochia spicata (L.) Fryxell
Mesosetum filifolium Hubb.
Miconia albicans (Swartz) Triana
Mimosa albida Humb. & Bonpl. ex Willd.
M. bahamensis Benth.
M. pudica L.
M. somnians Humb. & Bonpl. ex Willd.
Morinda royoc L.
Myrica cerifera L.
Nectandra cf. *salicifolia* (Kunth) Nees
Nymphaea ampla (Salisb.) DC.
Oxalis frutescens L.
Panicum virgatum L.
Parathesis cubana (A. DC.) Molinet & Maza
Paspalum pulchellum Kunth
P. setaceum Michx.
P. serpentinum Hochst. ex Steud.
Phthirusa pyrifolia (Kunth) Eichler
Pinus caribaea Morelet
Piriqueta cistoides (L.) Griseb.
Pithecellobium insigne Micheli
Pluchea foetida L.
Polygala paniculata L.
P. variabilis Kunth
Polypremum procumbens L.
Portulaca pilosa L.
Pterolepis stenophylla Gleason
Quercus oleoides Schltdl. & Cham.
Randia lundellii Standl.
Randia sp. (S267)
Rhynchosia americana (Mill.) M.C. Metz.
Roupala montana Aubl.
Sauvagesia erecta L. ssp. *brownei* (Planchon) Sastre
S. erecta L. ssp. *erecta*
Schultesia guianensis (Aubl.) Malme
Scleria bracteata Cav.
Semialarium mexicanum (Miers) A.M.W. Mennega
Senna undulata (Benth.) H.S. Irwin & R.C. Barneby
S. uniflora (Mill.) H.S. Irwin & R.C. Barneby
Setaria parviflora (Poir.) Kerguélen
Sida linifolia Cov.
Simarouba glauca DC.
Sorghastrum setosum Hitchc.
Spermacoce verticillata L.
Spiranthes torta (Thunb.) Gray & H.R. Sweet
Stachytarpheta jamaicensis (L.) Vahl
Stigmaphyllon ellipticum (Kunth) A. Juss.
Stylosanthes guianensis (Aubl.) Sw.
S. viscosa Sw.
Swartzia cubensis (Britton & P. Wils.) Standl.
Syngonium angustatum Schott
Ternstroemia tepezapote Schltdl. & Cham.
Tetracera mollis Standl.
Turnera aromatica Arbo
T. diffusa Willd.
T. ulmifolia L.
Vismia camparaguey Sprague & Riley
Vitex gaumeri Green
Waltheria indica L.
Wedelia acapulcensis Kunth
Xylosma anisophyllum Standl.
Xyris ambigua Beyr. ex Kunth
Zamia loddigesii Miq.
Zornia diphylla (L.) Pers.

Savanna/forest transition
Alibertia edulis (L. Rich.) A. Rich.
Amaioua corymbosa (Willd.) Kunth

Andira inermis (W. Wr.) DC.
Aspidosperma megalocarpon Müll. Arg
Brosimum alicastrum Sw.
Bucida buceras L.
Bursera simarouba Sarg.
Calliandra tergemina (L.) Benth.
Calophyllum brasiliense Camb.
Cassipourea guianensis Aubl.
Cecropia peltata L.
Chiococca alba (L.) Hitchc.
Chomelia protracta (Bart. ex DC.) Standl.
Chrysophyllum mexicanum T.S. Brandegee
Clusia massoniana Lundell
Coccocypselum guianense (Aubl.) K. Schum.
Coccoloba cf. *barbadensis* Jacq.
C. cozumelensis Hensl.
Cojoba recordii Britton & Rose
Connarus lambertii Britton
Crossopetalum cf. *puberulum* (Lundell) Lundell
Croton sp.
Cupania rufescens Triana & Planch.
Enterolobium cyclocarpum (Jacq.) Griseb.
Erythroxylum guatemalense Lundell
Eugenia buxifolia Lam.
Ficus maxima Miller
Guazuma ulmifolia Lam.
Guettarda gaumeri Standl.
Hampea trilobata Standl.
Helicteres mexicana Kunth
Hirtella americana L.
Ipomea tuxtlensis House
Jatropha gaumeri Greenman
Laetia thamnia L.
Lisianthius axillaris Kuntze
Lonchocarpus luteomaculatus Pittier
L. rugosus Benth.
Lysiloma latisiliquum (L.) Benth.
Machaonia acuminata Kunth
M. lindeniana Baill.
Malmea depressa (Baill.) R.E. Fr.
Manilkara zapota (L.) Van Royen
Matayba oppositifolia (A. Rich) Britton
Melochia spicata (L.) Fryxell
Miconia ciliata Benth.
M. prasina (Sw.) DC.
Odontomema callistachyum (Schltdl. & Cham.) Kuntze
Ouratea lucens (Kunth) Engl.
O. nitida (Sw.) Engl.
Palicourea triphylla DC.
Passiflora urbaniana Killip
Paullinia pinnata L.
Phyllanthus brasiliensis (Aubl.) Poir.
Pithecellobium lanceolatum (Humb. & Bonpl.) Benth.
P. macrandium Donn. Sm.
Protium copal (Cham. & Schltdl.) Engl.
Pseudobombax ellipticum (Kunth) Dugand
Psychotria frucitetorum Standl.
P. officinalis Kuntze
Randia aculeata L.
Rauwolfia trichophylla Baker
Russelia sarmentosa Jacq.
Sabal mauritiiformis Griseb. & H. Wendl.
Sebastiania adenophora Pax & K. Hoffm.
Serjania adiantoides Radlk.
Sideroxylon obtusifolium (Roem. & Schult.) Penn.
Simarouba glauca DC.
Smilax spinosa Miller
Tabernaemontana alba Mill.
Ternstroemia tepezapote Schltdl. & Cham.
Thevetia ahuai (L.) Rafin.
Trophis racemosa (L.) Urban
Waltheria indica L.
Wedelia aff. *hispida* Kunth

Wetland

Acrostichum aureum L.
Annona glabra L.
Bacopa monnieri (L.) Pennell
Bletia purpurea (Lam.) DC.
Boehmeria cylindrica (L.) Sw.
Buchnera pusilla Kunth
Caperonia sp.
Centella asiatica (L.) Urban
Cladium jamaicense Crantz
Cyperus aggregatus Endl.
Dalbergia glabra (Mill.) Standl.
Eleocharis cf. *interstincta* R. Br.
Eleocharis sp. (S304)
Ficus cf. *ovalis* Miq.
Fuirena cf. *umbellata* Rottb.
Galactia striata (Jacq.) Urb.
Haematoxylum campechianum L.
Heteropteris laurifolia (L.) A. Juss.
Hymenocallis littoralis (Jacq.) Salisb.
Ipomea indica Merrill
Ludwigia octovalvis (Jacq.) Raven

Malpighia glabra L.
Mikania micrantha Kunth
Mimosa asperata L.
Mitreola petiolata (J.F. Gmel.) Torr. & Gray
Nymphaea ampla (Salisb.) DC.
Nymphoides humboldtianum Kunth
Pachira aquatica Aubl.
Passiflora foetida L.
Philodendron sp.
Phthirusa pyrifolia (Kunth) Eichler
Phyla nodiflora Greene
Phyla stoechadifolia (L.) Kunth
Pluchea foetida L.
Polygonum punctatum Elliot
Rhizophora mangle L.
Rhynchospora holoschoenoides Vahl
Rhynchospora sp. (S256)
Sagittaria lancifolia L.
Salvinia minima Baker
Scleria distans Poir.
Struthanthus orbicularis (Kunth) Blume ex Schult.
Thelypteris aff. *ovata* R.P. St. John
Tillandsia balbisiana Schult.f.
Typha dominguensis Pers.
Utricularia foliosa L.
Wedelia acapulcensis Kunth